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USSR Report

LIFE SCIENCES

BIOMEDICAL AND BEHAVIORAL SCIENCES

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CONTENTS

AGROTECHNOLOGY

Intensive Technologies for Cultivation of Agricultural Crops
(ZASHCHITA RASTENIY, No 1, Jan 85)..... 1

Interrelationship Between Plant Nutrition and Plant Protective Measures
(V. Ye. Kuz'minov; ZASHCHITA RASTENIY, No 1, Jan 85)..... 7

Protective Measures, Chemicals for Controlling Plant Pests, Diseases, Weeds
(V. A. Zakharenko, V. I. Martynenko; ZASHCHITA RASTENIY, No 1, Jan 85)..... 10

Need for Improved Training of Scientific Personnel
(V. M. Bautin; ZASHCHITA RASTENIY, No 1, Jan 85)..... 19

Improvements in Training for Plant Protection Specialists Required
(K. V. Popkova; ZASHCHITA RASTENIY, No 1, Jan 85)..... 23

Measures for Reducing Adverse Effects of Plant Protection Agents
(V. F. Samersov, A. F. Skur'yat; ZASHCHITA RASTENIY, No 1, Jan 85)..... 26

Economic Thresholds for Plant Damage by Insects
(B. A. Areshnikov, M. G. Kostyukovskiy, et al.; ZASHCHITA RASTENIY, No 1, Jan 85)..... 34

New Mobile Plant Protection Laboratories
(S, P. Starostin, V. M. Yefimov, et al.; ZASHCHITA RASTENIY, No 1, Jan 85)..... 41

New Equipment for Plant Protection Operations
(M. I. Nezbritskiy; ZASHCHITA RASTENIY, No 1, Jan 85).... 43

Plant Protection Work of Abkhaz ASSR Quarantine Inspection Service
(V. I. Gagua, A. I. Prokopenko; ZASHCHITA RASTENIY, No 1, Jan 85)..... 48

Automatic System for Combating Potato Blight
(A. V. Filippov, B. I. Gurevich, et al.; ZASHCHITA RASTENIY, No 1, Jan 85)..... 52

Characteristics of Kafpon, Amidim Herbicides
(A. M. Davydov, A. A. Petunova, et al.; ZASHCHITA RASTENIY, No 1, Jan 85)..... 55

Characteristics of Pesticides for Orchards and Gardens
(ZASHCHITA RASTENIY, No 1, Jan 85)..... 57

Measures for Preventing Potato Losses
(Ye. D. Kuznetsova; ZASHCHITA RASTENIY, No 1, Jan 85).... 66

Development Program
(Editorial; ZASHCHITA RASTENIY, No 12, Dec 84)..... 70

Training for Specialists in Plant Protection
(Yu. V. Vsevolozhskiy; ZASHCHITA RASTENIY, No 12, Dec 84)..... 74

Plant Protection Specialist Training--Matter of Paramount Importance
(N. V. Bondarenko; ZASHCHITA RASTENIY, No 12, Dec 84).... 77

Progress Report of USSR Ministry of Agriculture
(ZASHCHITA RASTENIY, No 12, Dec 84)..... 85

Work in Laboratory of Molecular and Biological Bases of Plant Immunity
(Yu. N. Fadeyev; ZASHCHITA RASTENIY, No 12, Dec 84)..... 89

Biotechnology of Virus-Free Potato Growing
(O. S. Melik-Sarkisov; ZASHCHITA RASTENIY, No 12, Dec 84)..... 95

Pathogenic Viruses of Plants Studied at All-Union Scientific Research Institute of Applied Molecular Biology and Genetics
(I. G. Atabekov; ZASHCHITA RASTENIY, No 12, Dec 84)..... 100

Contribution of Entomologists to USSR Food Program
(ZASHCHITA RASTENIY, No 12, Dec 84)..... 103

Educational Film on Raising Winter Rye
(L. P. Sechina; ZASHCHITA RASTENIY, No 12, Dec 84)..... 113

Machinery for Plant Protection--News From Abroad
(Kh. Dyunnebayl; ZASHCHITA RASTENIY, No 12, Dec 84)..... 114

Meeting of Plant Protection Section of All-Russian Department of All-Union Academy of Agricultural Sciences
(Ye. D. Kuznetsova; ZASHCHITA RASTENIY, No 12, Dec 84)... 117

Conferences of Farm Pest Forecasters
(I. V. Gayvoronskaya; ZASHCHITA RASTENIY, No 12, Dec 84). 120

All-Union Conference of Phytovirologists in Lithuania
(L. N. Samsonova; ZASHCHITA RASTENIY, No 12, Dec 84)..... 122

Work on Biological Method in Georgian SSR
(ZASHCHITA RASTENIY, No 12, Dec 84)..... 125

Soil Immobilization of Phosphatase
(S. A. Abraman, A. Sh. Galstyan; DOKLADY AKADEMII NAUK ARMYANSKOY SSR, No 3, 1984)..... 126

BIOCHEMISTRY

Discovery and Intracellular Localization of Two Polyphosphate-Phosphohydrolases With Different Substrate Specificity in Neurospora Crassa Slime
(L. V. Trilisenko, V. M. Vagabov, et al.; DOKLADY AKADEMII NAUK SSSR, No 3, Jan 85)..... 127

Novel Amidated Neural Phosphopeptide
(N. V. Voronova, D. G. Kacharava; SOOBSHCHENIYA AKADEMII NAUK GRUZINSKOY SSR, No 3, Jun 84)..... 128

BIOPHYSICS

Effect of Electric Excitation Strength and Duration on Light Radiation Parameters of Marine Copepoda
(P. V. Yevstigneyev; ZHURNAL OBSHCHEY BIOLOGII, No 1, Jan-Feb 85)..... 129

Sedimentation Analysis of Yersinia Pseudotuberculosis Lipopolysaccharide-Protein Complex
(I. M. Yermak, T. F. Solov'yeva, et al.; BIOFIZIKA, No 6, Nov-Dec 84)..... 137

Bacteriorhodopsin Fluorescence and Its Significance in Primary Photoprocesses in Purple Membranes at -196°C
(V. A. Sineshchekov, S. P. Balashov, et al.; BIOFIZIKA, No 6, Nov-Dec 84)..... 137

X-Ray Diffraction Analysis of Native and Denatured Bovine Lens
(A. V. Krivandin, Yu. M. L'vov, et al.; BIOFIZIKA, No 6, Nov-Dec 84)..... 138

Potassium Channels of Frog Photoreceptor Plasma Membranes
(S. S. Kolesnikov, A. L. Lyubarskiy; BIOFIZIKA, No 5, Sep-Oct 84)..... 138

Effective Water Permeability of Membranous Plant Cell Structures at Subzero Temperatures
(Yu. I. Balla, N. G. Bakradze, et al.; BIOFIZIKA, No 5, Sep-Oct 84)..... 139

X-Ray Diffraction Studies on Frog Crystalline Lens
(A. V. Krivandin, Yu. M. L'vov, et al.; BIOFIZIKA, No 5, Sep-Oct 84)..... 139

Photogeneration of Superoxide Radicals by Ommochromes and Their Role in Antioxidative Protection of Invertebrate Ocular Cells
(A. Ye. Dontsov, V. A. Lapina, et al.; BIOFIZIKA, No 5, Sep-Oct 84)..... 140

Simulation Models of Regional Deposition of Aerosol Ions in Human Lungs
(F. G. Portnov, S. Ye. Fal'kenshteyn, et al.; BIOFIZIKA, No 5, Sep-Oct 84)..... 140

Configurational Generators of Neuronal Rhythmicity
(V. L. Dunin-Barkovskiy; BIOFIZIKA, No 5, Sep-Oct 84).... 141

BIOTECHNOLOGY

Biochemical Evaluation of Quality of Broilers Fed Hydrogenous Bacterial Biomass
(I. N. Trubachev, Yu. N. Okladnikov, et al.; VOPROSY PITANIYA, No 1, Jan-Feb 85)..... 142

Miracle Protein
(M. Chudina; TRUD, 16 Feb 85)..... 148

ENVIRONMENT

Oxygen Isotope Composition of Drifting Arctic Ice in Relation to Activation of Phytoplankton Growth at Boundary of Melting Ice
(V. I. Lobyshev, I. A. Mel'nikov, et al.; BIOFIZIKA, No 5, Sep-Oct 84)..... 149

EPIDEMIOLOGY

Use of Burrows of Rhombomys Opimus (Rodentia, Cricetidae) and Epizootological Significance of Uninhabited Colonies in Central Asian Plague Foci
(L. A. Burdelov, A. S. Burdelov, et al.; ZOOLOGICHESKIY ZHURNAL, No 12, Dec 84)..... 150

FOOD TECHNOLOGY

New Type of Bread
(M. Dmitruk; SOTSIALISTICHESKAYA INDUSTRIYA, 10 Feb 85).. 151

LASER EFFECTS

Chlorophyll Photosensitized Luminescence of Singlet Oxygen in Polystyrene Films: Kinetics and Quenching After Laser Flash
(S. Yu. Yegorov, A. A. Krasnovskiy, et al.; BIOFIZIKA, No 6, Nov-Dec 84)..... 152

Lasers in Management of Postinfarction Arrhythmia
(M. Aydinov; TRUD, 16 Feb 85)..... 152

MICROBIOLOGY

Redox Potential Dynamics in E. Coli Batch Culture
(O. N. Oktyabrskiy, G. V. Smirnova, et al.; BIOFIZIKA, No 5, Sep-Oct 84)..... 154

Spectroturbidimetric Studies on Bacterial Agglutination
(I. B. Zhulin, V. I. Panasenko, et al.; BIOFIZIKA, No 5, Sep-Oct 84)..... 154

MILITARY MEDICINE

Military Medical Training Book Reviewed
(KRASNAYA ZVEZDA, 3 Feb 85)..... 156

NONIONIZING ELECTROMAGNETIC RADIATION EFFECTS

SHF-Dielectric Studies on Biopolymer Hydration
(T. Yu. Shchegoleva; BIOFIZIKA, No 6, Nov-Dec 84)..... 158

Thermodynamic Potential, Stress Tensor and Surface Tension of Nonmixing Electrolyte Layers in Electric Field
(V. N. Akimov, V. M. Kim; BIOFIZIKA, No 6, Nov-Dec 84)... 158

Nature of g Signal at CA. 3.0 in EPR Spectra of Cooled Biological Specimens
(A. I. Tsapin, S. V. Khangulov, et al.; BIOFIZIKA, No 6, Nov-Dec 84)..... 159

Magnetic Susceptibility and Magnetic "Capture" of Cells
(A. N. Shalygin, S. B. Norina, et al.; BIOFIZIKA, No 5, Sep-Oct 84)..... 159

Mechanism of SHF-Induced Changes in Erythrocyte Electrophoretic Mobility
(V. L. Sigal, P. V. Osadchiy, et al.; BIOFIZIKA, No 5, Sep-Oct 84)..... 160

PHARMACOLOGY AND TOXICOLOGY

Synthesis and Psychotropic Properties of Human Interferon Alpha-$_2$ [122-125] Tetrapeptide
(O. S. Pansuyevich, G. I. Chipens, et al.; KHIMIKO-FARMATSEVTICHESKIY ZHURNAL, No 1, Jan 85)..... 161

Testing Phytomenadione Activity During Experimental Hypocoagulation
(D. A. Yenikeyeva, V. N. Byzova, et al.; KHIMIKO-FARMATSEVTICHESKIY ZHURNAL, No 1, Jan 85)..... 162

Development of Surfactants With Pronounced Pharmacological Activity
(V. I. Kabachnyy, V. P. Chernykh, et al.; KHIMIKO-FARMATSEVTICHESKIY ZHURNAL, No 1, Jan 85)..... 162

Synthesis and Antiviral Activity of Alkoxycarbonyl Methoxybenzo-2,1,3-Thiadiazoles and Some of Their Derivatives
(I. A. Belen'kaya, G. P. Krokhina, et al.; KHIMIKO-FARMATSEVTICHESKIY ZHURNAL, No 1, Jan 85)..... 163

Synthesis, Antimicrobic Activity and Mutagenic Activity of Beta-Hydroxyketones
(F. G. Saymkulova, I. I. Lapkin, et al.; KHIMIKO-FARMATSEVTICHESKIY ZHURNAL, No 1, Jan 85)..... 163

Antimicrobic Activity on Glycosides From Holothurians of Stichopodidae Family
(I. I. Mal'tsev, S. I. Stekhova, et al.; KHIMIKO-FARMATSEVTICHESKIY ZHURNAL, No 1, Jan 85)..... 164

Radiation Resistance of Albumin Preparations
(A. Kh. Kuptsov, G. V. L'vova, et al.; KHIMIKO-FARMATSEVTICHESKIY ZHURNAL, No 1, Jan 85)..... 165

Phosphorus Metabolism and Tropane Alkaloid Biosynthesis in Plants
(L. N. Bereznegovskaya; RASTITEL'NYYE RESURSY, No 1, Jan 85)..... 165

Achillea Collina Essential Oil and Its Antibacterial Activity
(S. S. Mishurova, R. M. Abbasov, et al.; RASTITEL'NYYE RESURSY, No 1, Jan 85)..... 166

Tibetan Multicomponent Medicinal Mixtures. Part 2. Selected Plant Combinations With Defined Biological Action Spectrum
(T. A. Aseyeva, B. B. Batuyev, et al.; RASTITEL'NYYE RESURSY, No 1, Jan 85)..... 166

PHYSIOLOGY

Cardiovascular System Reaction During Orthostatic Test in Persons With Different Work Capacities
(V. V. Ivanov; GIGIYENA TRUDA I PROFESSIONAL'NYYE ZABOLEVANIYA, No 1, Jan 85)..... 168

PUBLIC HEALTH

Development of Public Health Care in USSR
(VESTNIK STATISTIKI, No 2, 1985)..... 169

Brief
Medical Care of Aged 177

First Steps Toward General Health Maintenance
(Ye. Il'icheva, Yu. Lukasik; TRUD, 7 Feb 85)..... 178

Recruiting Hospital Attendants
(V. Belyayev; SOVETSKAYA ROSSIYA, 31 Jan 85)..... 178

Glasses by Prescription Only
(KOMMUNIST, 3 Feb 85)..... 179

Scientific and Technical Advances and Further Improvements in Work Safety in Construction Industry
(S. L. Dvornikov; PROMYSHLENNOYE STROITEL'STVO, No 1, Jan 85)..... 179

Justification of Request for Emergency Medical Assistance
(V. Tropnikova; TIKHOOKEANSKAYA ZVEZDA, 30 Jan 85)..... 180

Public Health as National Wealth
(V. Belitskiy; TRUD, 19 Feb 85)..... 180

Contribution of Common Sense to Health and Longevity
(M. Dmitruk; SOTSIALISTICHESKAYA INDUSTRIYA, 24 Feb 84).. 181

AGROTECHNOLOGY

INTENSIVE TECHNOLOGIES FOR CULTIVATION OF AGRICULTURAL CROPS

Moscow ZASHCHITA RASTENIY in Russian No 1, Jan 85 pp 2-5

/Article: "Program for Intensive Technologies"/

/Text/ The Soviet people are glancing into the future with both confidence and optimism. The party is making preparations for its 27th Congress and work is being carried out in connection with new editing of the program. The plans are being developed for the 12th Five-Year Plan and for the future. The principal goal of these plans is as follows: relying upon improved work results by the Soviet people, to raise national well-being to a qualitatively new level and to raise considerably the material and spiritual standard of living of the people. The task is being assigned of attaching more dynamism to the economy, solving the problems of intensification in a more energetic manner and reequipping production based upon the latest scientific and engineering achievements.

The 4th year of the five-year plan is an important stage in the development of our economy. The operational results during the final period of the year will determine to a large degree the year's overall results and also the base which will become the principal one for solving the more complicated tasks.

The Soviet people have warmly approved the decisions handed down during the October (1984) Plenum of the CPSU Central Committee. The party's concern for the might of the USSR and for the welfare of the people has been displayed very clearly in the long-term program for land reclamation up to the year 2000, as approved during the Plenum.

In speaking before the October (1984) Plenum of the CPSU Central Committee, Comrade K.U. Chernenko emphasized that we must consistently intensify the production of grain and reinforce the positive trends in livestock husbandry. The singularly correct path to be followed for solving these vital tasks is all-round intensification of agricultural production and its conversion over to an industrial basis. Further increases will take place in the future in capital investments in agriculture and also in supplying agriculture with equipment and other material resources. "But the chief concern both today and in the future" stated K.U. Chernenko, "is to utilize these resources in a manner so as to produce a high return and to concentrate their use in those sectors where the greatest and most rapid results can be realized."

As is known, the Politburo of the CPSU Central Committee has adopted the decree entitled "On Urgent Measures for Increasing the Production of Winter Grain Crops Through the Introduction of Intensive Technologies." The decree outlines measures which are making it possible, based upon the use of intensive factors, to obtain more and better quality grain under all types of weather conditions. This is being achieved through the selection of highly productive varieties, the planting of crops following the best predecessor crop arrangements, mainly following clean fallow, fertilizer applications in accordance with norms and schedules which conform to the programmed yield, the use of integrated plant protection systems and observance of all of the work technologies called for.

With efficient observance of the mentioned requirements, the intensive technology makes it possible to obtain 50-60 quintals of high quality winter wheat per hectare.

The Politburo of the CPSU Central Committee has also discussed recommendations aimed at increasing the production of high quality spring wheat grain through the intensification of its cultivation in the Volga region, the Urals, Siberia and Kazakhstan. A complex of measures has been called for which is making it possible to increase considerably the spring wheat yields and the gross grain yield, especially that obtained from strong, durum and valuable varieties. Towards this end, the plans call for the active introduction of intensive wheat cultivation technologies which will be employed in strict conformity with the zonal farming systems.

The introduction of intensive technologies will make it possible to obtain millions of additional tons of high quality grain, mainly of strong and valuable wheat varieties, regardless of the weather conditions. Thus, stability will be ensured in grain production. The expenditures required for implementing the planned measures will be returned many times over. Here are some examples. Last year, the use of intensive technologies for the cultivation of grain crops in Tambov and Lipetsk oblasts produced an increase in yield of 10-15 quintals per hectare and in Krasnodar and Stavropol krays and in Moscow and Ivano-Frankovsk oblasts -- 20-25 quintals per hectare. At the Rossiya Kolkhoz in Novoaleksandrovskiy Rayon in Stavropol Kray, winter crops were grown on 475 hectares using an industrial technology and a yield of 55 quintals was obtained from each hectare -- 20 quintals more than from conventional fields. And at the Krasnoye Znamya Sovkhoz in Rasskazovskiy Rayon in Tambov Oblast and at the Zavety Il'icha Kolkhoz in Lipetskiy Rayon in Lipetsk Oblast, such tracts produced 21.5 additional quintals per hectare. On the whole, the increase in yield realized from use of the new technology during 1984 amounted to from 12 to 20 quintals per hectare.

At those kolkhozes and sovkhozes where correct crop rotation plans have been mastered, the structure of the area under crops has been developed in an efficient manner, seed production is well organized, skilful and intelligent use is being made of the land, equipment, fertilizers and plant protective agents, all work is being carried out during the best periods and on a high agro-technical level and high grain crop yields are being obtained annually.

In behalf of the 1985 harvest, the plans call for an expansion in the introduction of the intensive and improved technology for the cultivation of winter crops to 6.4 million hectares. The plans also call for spring wheat to

be grown using the intensive technology on 10.5 million hectares of fallow and second crops following fallow in the Volga region, northern Kazakhstan, Siberia and the Urals.

However, it must be borne in mind that the grain losses and deterioration in its quality may be considerable when use is made of the new technologies, especially in connection with damage caused by powdery mildew, septoria spot, root rots, rust, aphids, stink bugs, grain flies and other harmful objects. Experience has shown that the final result can be adversely affected by failure to take into account the phytosanitary requirements.

This is why an intensive technology, which is based mainly upon a high culture of farming, calls for the carrying out of timely and high quality protective measures, including chemical measures. The greatest results are realized when use is made of clean fallow. In this instance, a reduction also takes place in the infection of plants by cercosporosis root rots, the weediness of plantings is lowered and a sharp reduction takes place in the number of grain beetles (not to mention an improvement in the availability of moisture for the plants).

The USSR Ministry of Agriculture and VASKhNIL /All-Union Academy of Agricultural Sciences imeni V.I. Lenin/ have developed "Methodological Instructions for an Intensive Technology in the Cultivation of Winter Crops." The waging of a campaign against pests, diseases and weeds plays an important role in these recommendations. Prior to sowing, special importance is attached to chemically disinfecting the seed against smut diseases and root rots; during the periods from the appearance of the seedlings to tillering -- combating mice-like rodents, pentatomid, grain beetle, bog whortleberry and fleas and applying herbicides; from the commencement of tillering to the end of blossoming -- treatment against brown rust, powdery mildew and root rots; at the end of blossoming and during the phase of stem growth -- combating the pentatomid, greenbugs, Swedish and Hessian flies and thrips; during the period of milky ripeness -- treatment against shield bug larvae and the larvae of grain beetles and others.

As revealed by experience accumulated in the Ukraine, winter wheat grown following clean fallow on rich soil, in the republic's arid zone, furnishes yields which are higher by a factor of 1.5-2 than those obtained when this crop is cultivated following other predecessor crop arrangements. Even more important is the fact that high quality grain is obtained. Recently the Council of Kolkhozes for the Ukraine approved the experience of farmers at the Kolkhoz imeni Kalinin in Dnepropetrovsk Oblast, which annually obtains 50-60 quintals of strong and valuable wheat per hectare and supplies the state with more than 2,300 tons.

In particular, a very high return is being realized from use of the intensive technology for cultivating wheat in the zone of adequate moisture. This is borne out by three years of experience by grain growers in Ivano-Frankovsk Oblast.

This is why the Ukrainian farmers have expanded noticeably their grain cultivation areas on which progressive technologies are being employed. The

intensive technology is being employed for sowing more than 1.5 million hectares, including 600,000 hectares in the zone of adequate moisture.

At the Prapor Komunizmu Kolkhoz in Kolomyyskiy Rayon in Ivano-Frankovsk Oblast, wheat has already been under cultivation for 3 years using the new technology. In behalf of the 1985 harvest, 790 hectares have been sown. The program calls for not less than 70 quintals to be obtained per hectare. One of the most important elements of the intensive technology is integrated plant protection. A campaign against harmful objects commences directly on a farm with the chemical disinfection of the seed. Here an application of the TUR preparation is combined with pesticide treatments. The preparations are used twice against powdery mildew, rust and other diseases. Chemical weed control work is carried out on the plantings, a campaign is waged against mice-like rodents and other special measures are carried out.

The UkSSR Ministry of Agriculture has indicated those farms which, in behalf of the 1985 harvest, are to employ the intensive technology for sowing their winter wheat. A practical seminar was conducted for specialists attached to the oblast agricultural organs and base farms and special recommendations have been published.

In September of last year, at the commencement of the sowing of winter crops using the intensive technology, a correspondent from the journal paid a visit to the oblast. Here is what he had to say. Wheat will be grown on 20,000 hectares using the new technology. In the future, such areas will be increased to 100,000 hectares. The chief concern at the present time is to accumulate experience and to teach the personnel not only to ensure that high final results are being achieved but also to master all elements of the system.

"We possess experience in the use of highly productive technologies -- we grow corn, sugar beets, flax and potatoes in this manner" stated the chief of the Lvov Plant Protection Station Ivan Andreyevich Spodarik, "The station furnishes assistance to the farms in making efficient use of progressive methods, including those employed against field parasites. Towards this end, we composed methodological instructions, we conducted seminars and we even applied our expertise under extreme conditions. A great amount of attention was given to the organization of protective measures and to ensuring that effective control was exercised over their implementation."

At the Kolkhoz imeni 21st Parts"yezda in Zhidachovskiy Rayon, where grain crops are grown on 925 hectares, a yield of 34.1 quintals per hectare was obtained last year. After considering its potential, the kolkhoz has resolved to achieve an even higher yield. The grain crops will be grown on 150 hectares using the new technology. The plans now call for not less than 50 quintals per hectare to be obtained from this land.

"Plant protection work will play a chief role with regard to obtaining high yields" commented the chairman of the kolkhoz Nikolay Romanovich Klapko, "Taking into account the recommendations of the oblast station, we developed an effective system for protecting the crops. It will be introduced into operations by agronomist-entomologist Yevgeniy Pavlovich Rever, who has worked at his specialty for more than 20 years. We have accumulated considerable

experience in protecting grain crops. It is sufficient to state that in 1983 alone the timely treatment of grain crops with fundozole, during the heading phase, made it possible to obtain 6 additional quintals of grain per hectare. And the net profit realized from use of this method amounted to 50 rubles per hectare.

The chief agronomist at the kolkhoz, Yaroslav Vasil'yevich Gorin, believes that the introduction and mastering of the intensive technology will depend upon the assistance received from Sel'khozkhimiya and especially from the plant protection service.

"We are not offended by the attention being given to us by the rayon station, which has been headed for more than 25 years by Yelena Alekseyevna Yakhno. She often visits our kolkhoz and furnishes advice and assistance in organizing efficient plant protection work and in introducing progressive methods for protecting crops. Yes and I myself have attempted to monitor all innovations in this area and to ensure that they are placed in operation as rapidly as possible" stated Yaroslav Vasil'yevich.

There are 22 farms in Zhidachovskiy Rayon and each has a plant protection specialist. Intensive technologies for the cultivation of winter crops will be mastered on 2,000 hectares. Everything has been thought out very carefully, the phytosanitary situation for each field has been studied in detail, specific recommendations have been furnished and special seminars conducted. Agronomists from the rayon station have been assigned to some farms. In the room for the specialists, there are graphic diagrams, plans and tables. And they all have to do with the same subject -- integrated protection for winter wheat grown using the intensive technology.

"Such graphic aids" noted Ye.A. Yakhno, "are better than any lecture. Everything is immediately apparent: the recommended methods and the schedules and conditions for carrying them out, with the criteria for the number of harmful and useful types being taken into account."

On all farms in this and other rayons throughout the oblast, recommendations are available concerning the integrated protection of winter grain crops. Special attention has been given to preventive methods: crop rotation plans, a soil treatment system, sowing periods, norms and methods and balanced fertilizer applications. The system for combating pests, diseases and weeds was composed in accordance with the developmental phases for wheat and taking into account the use of all methods and resources. It bears mentioning that integrated protection for agricultural crops has now been introduced into operations on all farms, with each of these farms having specialists of the appropriate profile.

In 1984, for the very first time in Drogobychskiy Rayon in Lvov Oblast, they commenced wheat cultivation using the new technology on 200 hectares at the kolkhozes imeni Lenin and imeni 1 Maya. Here, under the direction of the rayon station, soil samplings were taken, a chart of feed weediness was prepared and a plan for special measures was outlined. The seed was chemically treated prior to sowing. In the spring, the plans called for chemical weed control work to be carried out and for the sowings to be treated with the TUR

preparation, jointly with fundozole, against lodging and powdery mildew and with rogor for combating aphids.

Together with the station's chief Ivan Kirillovich Goshko and the inter-rayon quarantine inspector Vasiliy Petrovich Tarasovich, we visited an inter-farm strain-changing enterprise (they are found in each rayon throughout the oblast). This enterprise supplies the farms with good quality seed of high reproductions. A productivity of 160 tons of seed every 24 hours -- winter wheat, winter barley, spring oats, lupine. Two PS-10 machines are available for carrying out chemical disinfection work. The seed decontamination work is started 3 weeks prior to sowing. This enterprise is in operation practically the entire year. The seed is distributed to the farms based upon written orders. The enterprise was built in 1980 and the expenditures for its construction were repaid by 1985. Its shareholders -- the rayon's kolkhozes.

"It should be possible to supply high quality seed for the entire rayon" stated the director of the enterprise Aleksandr Fedorovich Bets, "but there is still a shortage of storage facilities. We plan to build them and to organize lines for processing seed for flax and perennial grasses and also for the complete drying of small batches of seed."

Truly, serious attention is being given in Lvov Oblast to the preparation of high quality seed. Inter-farm enterprises in many rayons, equipped with modern equipment, are supplying seed for all of the farms. This has made it possible to centralize and improve the quality of the chemical disinfection work, which in turn has promoted not only a sharp reduction in the development of smut diseases and root rots but also growth in yields.

This year the specialists attached to the green cross service must ensure reliable protection for the wheat sowings being grown using the intensive technology. Reclaimed land requires special concern. A maximum return must be realized from each hectare. A thorough phytosanitary inspection must be organized, the appearance of pests, diseases and weedy plantings must be monitored constantly and the introduction of integrated systems and the efficient and effective use of pesticides ensured. Special attention must be given to the carrying out of agrotechnical and chemical work in a high quality manner and during the best periods and also to the thorough adjustment of special equipment.

Certainly, the intensive technology requires additional expenditures for fertilizers and plant protective agents. But the return from such resources will be sufficiently great. Importance is attached to utilizing these resources in an intelligent manner and to remembering that they produce maximum results only against a background of good agricultural practices and the strict observance of all technological processes.

7026
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INTERRELATIONSHIP BETWEEN PLANT NUTRITION AND PLANT PROTECTIVE MEASURES

Moscow ZASHCHITA RASTENIY in Russian No 1, Jan 85 p 7

/Article by V.Ye. Kuz'minov, deputy chief of Administration for Protection of Plants of Soyuzsel'khozkhimiya: "Strict Observance of Technological Discipline"/

/Text/ Experience accumulated in cultivating grain using the intensive technology confirms that crop losses can be eliminated and worthy increases realized in the form of additional products in those areas where technological discipline is observed and where plant protective measures are carried out. An example of this would be the experience of a number of farms in Moscow, Lipetsk and Ivano-Frankovsk oblasts and Krasnodar and Stavropol krays, where even under unfavorable weather conditions the grain yields exceeded those obtained using the conventional technology by 18-22 quintals or more per hectare.

Much depends upon how well the specialists are familiar with the phyto-sanitary situation on each field and also upon their ability to undertake in a timely manner the measures required for combating grain crop diseases, weeds and pests. The task of integrated plant protection consists of maintaining the leaf organism of plants in working condition up until the grain ripening phase.

The cultivation of wheat using the intensive technology will tolerate no blunders. The results realized from all work, especially in zones where the plant diseases and pests are very aggressive, are lowered sharply when the spraying of pesticides is carried out in an untimely or low quality manner. Thus, when cultivating wheat using the intensive technology at the Pamyat' Lenina Kolkhoz in Timashevskiy Rayon in Krasnodar Kray, the winter wheat variety Bezostaya 1 produced a yield of 41.3 quintals per hectare, Krinitsa -- 39.6 quintals per hectare and Partizanka -- 42.6 quintals per hectare; compared to the conventional technology, the increase in yield amounted to only 0.6, 2.8 and 1.7 quintals per hectare respectively. This proved to be insufficient for ensuring reimbursement for the additional expenditures involved. Thus the production cost for 1 quintal of winter wheat grown using the intensive technology did not decrease but rather it increased from 4.73 to 6.73 rubles.

Meanwhile, it turned out that the expenditures for carrying out this protective work amounted to 32-36 rubles per hectare. Why then, in view of this cost, was it not possible to obtain the additional 6-7 quintals of grain per hectare as planned?

It turned out that the chemical treatments were carried out without taking into account the phyto-sanitary situation out on the fields. In addition, the fungicides for combating powdery mildew and rust were applied late. The required degree of effectiveness in combating weeds was not achieved. The pentatomid and other pests caused some damage to the crops. The quality of preparation of the working pesticide solutions was not controlled by a toxicological laboratory. There were incidents involving poor adjustment of the working organs of sprayers. The consumption of pesticides and working liquid was established not under fixed conditions but rather directly in the field.

It is known that the development of many types of pests, diseases and weeds is dependent upon the conditions for the mineral nourishment of the plants and yet the kolkhoz's specialists, when developing measures for protecting the wheat plantings, failed to coordinate the use of pesticides with a raised application of NPK.

Such mistakes must not be made during the new year. Science has established the fact that supplying plants with complete mineral nourishment serves to lower the damage caused to wheat by diseases and promotes improved wintering of the crops. Early spring nitrogen top dressings improve the spring regeneration of leaves and restores the shoots of damaged plants. And, to the contrary, unsystematic and excessive applications of nitrogen fertilizers raise the aggressive nature of powdery mildew and intensify the reproduction of grain aphids and grain leaf beetles. Thus, when developing integrated plant protection for crops under cultivation using the intensive technology, the conditions for mineral nourishment of the plants should be taken into account.

Success in the integrated protection of plants is dependent to a large degree upon the skill and activity of the farm agronomists and the specialists attached to the rayon plant protection stations. Indeed the intensive technologies call for the use of highly effective and costly pesticides, especially herbicides and fungicides. Naturally, their use is justified only when high increases in yield can be obtained.

A great deal depends upon the farms and associations of Sel'khozkhimiya being supplied with sprayers. Correct action is being taken in those areas where the shortage in machines is being eliminated through the production of boom sprayers based upon the use of blower sprayers. However, it must not be forgotten that in the case of locally made booms the quality of the spray may be lower than that for plant made units and thus the operation of such machines must constantly be monitored by plant protection engineers and agronomists.

An intensive technology requires raised responsibility on the part of plant protection stations, forecast points and laboratories, toxicological laboratories and mechanized detachments of Sel'khozkhimiya RPO's /rayon production associations/ for the timely and high quality carrying out of work, for observance of the regulations and technology for the use of pesticides and for the introduction of scientific achievements and leading practice. In the time remaining before spring, the training of kolkhoz and sovkhoz specialists

must be completed and the farms must be provided with assistance in carrying out the mass training of machine operator personnel.

The work must be organized in a manner such that each ruble invested in plant protection pays for itself in the form of a weight increase in grain yield.

7026
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PROTECTIVE MEASURES, CHEMICALS FOR CONTROLLING PLANT PESTS, DISEASES, WEEDS

Moscow ZASHCHITA RASTENIY in Russian No 1, Jan 85 pp 12-14

/Article by V.A. Zakharenko, deputy director of the Central Institute for Agrochemical Services for Agriculture and V.I. Martynenko, deputy chairman of Soyuzsel'khozkhimiya Association: "A System of Measures"/

/Text/ A chief reserve for increasing grain production is that of farming intensification, that is, the extensive introduction of progressive technologies and highly productive varieties which will be resistant to unfavorable environmental factors and immune to diseases and pests. In such technologies, an important role is played by all-round use of chemical processes, improvements in the level of agricultural practices and the planting of grain crops following the best predecessor crop arrangements (fallow, leguminous-cereal grasses following the first cutting). This year, many farms expect to obtain 50-60 quintals of winter wheat grain per hectare from use of a progressive technology on fallow fields and other tracts.

Integrated plant protection, which combines all of the well known methods in economically and ecologically sound ratios, is proving to be of assistance in obtaining such high yields. The foundation for such protection is an objective evaluation of the phyto-sanitary situation, uncovering the potential danger posed by harmful organisms and thereafter carrying out the appropriate protective measures. In accordance with the results of an inspection, a certificate is prepared for each field indicating the oblast, rayon, farm, year of inspection, crop rotation plan, area of the field or tract, type and mechanical texture of the soil, depth of the arable layer, predecessor crop arrangement, the crop and the planned yield; the agrochemical characteristics are reflected (humus content, hydrolytic acidity, total amount of exchange bases, the pH, the content of P_2O_5 and K_2O and trace elements) and the phyto-sanitary condition, that is, the contamination by annual and perennial weeds (dicotyledonous -- sensitive and immune to 2.4-D, grass weeds), the spread of winter crop pests in plantings (click beetles, winter moth, leaf beetle, aphids, stink bug) and diseases (loose and covered smut, root rots, snow mould, powdery mildew, brown, yellow and stalk rust).

The complex of protective measures includes agrotechnical methods (fertilizer applications in balanced proportions, the use of resistant varieties, mechanical methods for combating weeds) and the use of pesticides, while taking into account the actual spread and economic thresholds for harm caused by harmful organisms.

TABLE 1

Seed Disinfectant	Expenditure Norm (in kg per ton)	Effect on Pathogens: Smut — Loose	Smut — Covered	Root Rot — Fuzar-iosis	Root Rot — Helmintho-sporiosis	Anther Mold	Effect on Soil-Inhabiting Pests
Baytan, 15% s.p.	2	+	+	+	+	-	-
Baytan-universal, 24.5% s.p.	2	+	+	+	+	-	-
Benlat (fundozole) 50% s.p.	2-3	+	+	+	-	-	-
Vitavaks, 75% s.p.	2.5-3	+	+	-	+	-	-
Vitavaks 200, 75% s.p.	3	+	+	+	+	-	-
Hexatiuram, 80% s.p.	2	-	+	+	+	-	-
Gammahexan, 50% s.p.	2	-	+	-	-	-	+
Granozan, 1.8-2.3% dust with a dye	1-2	-	+	+	+	+	-
Pentachlornitrobenzol, 25% s.p.	2	-	+	+	+	+	-
Pentatiuram, 50% S.P.	1.5-2	-	+	+	+	+	-
TMTD, 80% s.p.	1.5-2	-	+	+	+	+	-

The pre-sowing decontamination of seed is mandatory. The disinfectants are selected taking into account their effect on the pathogens of smut diseases, root rots, anther mold and soil-inhabiting pests (see Table 1). The seed is treated using a water suspension of preparations or with moistening (10 liters of water per ton of seed). In order to expand the spectrum of action, particularly in the interest of preventing lodging of plants and raising the immunity to unfavorable factors, it is recommended that some of the disinfectants (benlat, 50% s.p; vitavaks, 75% s.p; granozan, 1.8-2.3%) be used in a mixture with the TUR preparation, 60% v.r., 2-6 liters per ton. When use is made of the mixture, the consumption of water for moistening purposes is lowered and amounts to 8 liters for a minimal TUR norm and for a maximum -- 4 liters per ton of seed. The following biological preparations are recommended for the pre-sowing dusting of seed in the interest of suppressing root rots: trichotetsin, 1% dust, activity 10,000 micrograms per gram (2 kilograms per ton) and phytobacteriomitsin, 5% dust, activity 50,000 units per gram (3 kilograms per ton).

The group of fungicides listed in Table 2 is recommended for use in combating the pathogens of rust (brown, yellow, stem), powdery mildew and also root rots and snow mold during the growing season for winter wheat.

In order to ensure economically sound use of the disinfectants and fungicides, an evaluation should ideally be carried out on the danger of crop losses for specific levels of development for the diseases and the losses should be compared against the proposed expenditures for carrying out the treatments. With the appearance of rust, use can be made of the data furnished by K.M. Stepanov and A.Ye. Chumakov. The approximate wheat losses caused by smut funguses are computed using the equations:

TABLE 2

Preparation	Expenditure Norm per Hectare (in liters, kg)	Effect on Pathogens: Rusts			Powdery Mildew	Snow Mold	Root Rots
		Brown	Yellow	Stem			
Aphos, 50% k.e.	6	+	+	+	-	-	-
Bayleton, 25% s.p.	0.5-1	+	+	+	+	-	-
Benlat (Fundozol), 50% s.p.:							
winter spraying during tillering phase	0.3-0.6	-	-	-	-	+	+
spring-summer spraying	0.5-0.6	-	-	-	+	+	+
Polykarbatsin, 80% s.p.	5	+	+	+	-	-	-
FS-UMO, 44% solution (aphos)	6.8	+	+	+	-	-	-
Tsineb, 50% s.p.	3-4	+	+	+	-	-	-
Plantavaks, 20% k.e.	2-4	+	+	+	-	-	-
Tilt, 25% k.e.	0.5	+	+	+	+	-	+

$y = 20x-8x^2$ (for smut infection up to 1.25%),

$y = 11.55 + 0.76x$ (for smut infection greater than 1.25%), where y represents overall crop losses (%) and x -- smut development in a planting (%). In order to determine the shortfall in yield caused by powdery mildew, use is made of the equation $y = 2.0 \; x$, where x represents the infection of the four upper leaves during the period between heading and the commencement of grain ripening.

The principle of economic soundness in the use of fungicides will be realized in those instances where the value of the crop protected exceeds the expenditures for the protective measures. This principle must be observed when developing measures for combating pests and weeds.

First of all, a determination is made regarding the spread of harmful organisms on the winter sowings and their potential danger taking into account the economic thresholds for damage (see Table 4). It is recommended that pesticides be employed on fields on which the number of pests exceeds the threshold figure (see Table 5).

The peculiarities involved in the use of rodent poisons for combating mice-like rodents and susliks are presented in Table 6.

Damp grain bactorodentside (a titer of not less than 1 billion per gram) can be used against field mice, distributing it during the spring, winter or autumn at the rate of 1-2 kilograms per hectare.

Within the system of protective measures, an important role is played by efforts directed towards controlling weeds, since in addition to devouring nutrients they also cast shade upon cultivated plants and serve as havens for pests and disease pathogens. A considerable portion of the weeds is destroyed during the principal and pre-sowing soil cultivations and yet this does not preclude the use of

TABLE 3

Development of Disease (%)	Losses in Wheat Crop (%) During Development: Brown Rust During Phase: Heading	Blossoming	Milky Ripeness of Grain	Yellow Rust During Phase of: Heading	Grain Formation	Stem Rust During Phase of Complete Grain Ripeness
5	0.7	0.2	-		0	-
10	3.0	1.0	0	6	3.4	0.5
20	7.8	2.3	0.8	12	5.8	3.4
30	13.3	5.4	1.4	18	9.3	8.0
40	20.0	10.0	3.0	24	13.3	15.0
50	26.0	14.0	6.0	30	17.7	29.0
60	32.0	18.0	8.8	36	22.2	43.0
70	37.2	22.1	11.5	42	26.0	54.0
80	41.5	26.5	14.4	48	28.5	61.0
90	45.8	30.8	17.0	54	30.6	68.0
100	50.0	35.0	20.0	60	33.0	75.0

herbicides in those instances where there is severe weediness. They are selected taking into account the specific structure and number of weeds and the economic thresholds for the damage caused by them.

In cereal grain crop sowings, one usually finds blue-bottle, black bindweed, drug fuminary, chickweed, rye brome, lamb's quarters, silky apre, Kentucky bluegrass, wild oats shepherd's purse, hemp nettle, cleavers, scentless mayweed, field spurrey, field violets and field pennycress. In many zones, a threat is posed by perennial weeds: thistle, coltsfoot, field sowthistle, couch-grass, common horsetail and sorrel.

Herbicides of the 2,4-D and 2M-4X groups, which are used very extensively, suppress annual dicotyledonous weeds: blue-bottle, wild mustard, common mustard, stinging nettle, common groundsell, shepherd's purse, garden purslane, amaranth and field pennycress and also many perennial weeds: field sowthistle, common dandelion and types of plantain. However, these preparations are not sufficiently effective against such dicotyledonous weeds as scentless mayweed, chickweed, drug fumitory, cleavers and field violets or against grass family weeds -- silky apre, annual meadow grass, foxtail, wild oats. In addition, if preparations of the 2.4-D group are used for an extended period of time on the same fields, the threat arises of species appearing which are immune to them.

For combating dicotyledonous weeds which are sensitive to 2,4-D, it is recommended that use be made of amino salt 2,4-D, 40 percent (or 50 percent) water soluble concentrate, 1.5-2.5 (or 1.2-2) liters per hectare; butyl ether 2.4-D, 72 percent tech., 0.4-0.7 liters per hectare; butyl ether 2.4-D, 43 percent k.e., 0.7-1.2 liters per hectare; octyl ether 2,4-D, 42 percent k.e., 0.7-1.2 liters per hectare;

TABLE 4

Pest	Time of Count	Economic Threshold For Damage
Winter moth	Seedlings	2-3 caterpillars per m^2
Click beetles	Prior to sowing	5-8 larvae per m^2
Locusts	Seedlings - tillering	5-10 imago or larvae per m^2
Shield bug	Spring growth - tillering	1.5-2 bugs per m^2
	Commencement of grain formation	8-10 larvae per m^2
	Milky ripeness	2 larvae per m^2
Grain beetle	Seedlings - tillering, winter crop growth in the spring	1-3 larvae per m^2
Leaf beetle	Tillering	40-50 beetles per m^2
	Shooting - heading	1 larvae per 2 plants, damage to 15% of leaf surface
Grain aphids	Shooting	10 aphids per stalk; 5-6 aphids per ear; 500 aphids per 100 sweeps of insect net.

chlorocrotyl ether 2,4-D, 44 percent k.e., 0.7-1.1 litérs per hectare; 2M-4X, 80 percent soluble powder and 40 percent water solution, 1.3-2 kilograms per hectare and 2.5-4 liters per hectare respectively; acid 2,4-D, 10 percent gran., 10-12 kilograms per hectare.

It should be borne in mind that 2M-4X and amino salt 2.4-D act in a less severe manner on cultivated plants and are less volatile than ethers of 2.4-D. On fields contaminated by perennial weeds, the 2,4-D ethers are more effective provided the crop rotation plan is not saturated by crops which are susceptible to these herbicides.

In order to remove weeds which are immune to 2,4-D from fields, particularly scentless mayweed, chickweed, bindweed, cleavers, hemp nettle and field spurrey, use can be made of 2M-4XP, 50 percent v.r., 4-6 liters per hectare, a mixture of 2m-4X and 2M-4XP with ioxsinyl (aktril AS, 32 percent v.r., 1.25-3 liters per hectare and aktryl M, 52 percent v.r., 1-3.5 liters per hectare) and also a mixture of 2.4-D, 2M-4X and 2M-4XP with banvel-D (banlen, 27 percent v.r., 4-8 liters per hectare; diamet-D, 44.6 percent v.r., 2.5-3.9 liters per hectare; diapren, 40 percent v.r., 3-5 liters per hectare; dialen, 40 percent v.r., 1.9-3 liters per hectare). Bazagran is effective against chickweed and cleavers: 48 percent v.r. (2-4 liters per hectare), aniten S, 44 percent v.r. (2-3 liters per hectare) and aniten M, 33 percent k.e. (2.1-3 liters per hectare); these weeds and also species of matricary, sowthistle, buttercups and sorrel are destroyed by kambilen, 29.4 percent k.e. (4-6 liters per hectare) and annual grasses and dicotyledonous weeds -- by dozanekt, 80 percent s.p. (3-5 kilograms per hectare).

TABLE 5

Preparation	Expend. Norm per Hectare (liters, kg)	Pest	Time, Method of Treatment
Bazudin (diazinon): 40% s.p.	2-2.5	Grain beetle	Spraying of seedlings
60% k.e.	1.5-1.8	"	Ibid
5% gran.	50	"	Application to soil with seed
Volaton (foksim): 50% k.e.	2	"	Spraying of seedlings
	1.5	Grain moth	Spraying during growing season
	1.6	Shield bug	Ibid
5% gran.	75	Grain beetle	Application to soil with seed
Gamma-isomer GXTsG:			
2% gran., large-grain	50	Click beetles, chewing moths	Ibid
16% MME	2-2.5	Grain beetle, grain flies	Spraying prior to shooting phase
GXTsG:			
12% dust (1.2% gamma-isomer GXTsG)	15-20 kg/ton	Soil inhabiting and chewing pests	Pre-sowing seed treatment
25% powder of fosmuke 2.5% gamma-isomer TXTsG)	6-8	Soil inhabiting pests, chewing moths	Soil application prior to sowing using strip (row) method in centers of pest infestation
Carbophos, 30%k.e.	0.5-1.2	Aphids, thrips	Spraying during growing season
Metation (sumition)	0.6-1	Shield bug	Ibid
50% k.e.	2-2.5	Grain moth	"
Metaphos (metilparation):		Grain beetle, shield bug, grain flies, grain moth, aphids, leaf beetle, thrips, beet webworm, locusts	"
40% k.e.	0.5-1		
30% s.p. (vofatox)	0.7-1.4		
Ritsifon, 30% chlorophos solution	1.5-3	Shield bug, grey grain moth	Air-spraying during growing season using UMO method
Fozalon, 35% k.e.	1.5-2	Leaf beetle, aphids, beet webworm	Air-spraying during growing season
Phosphamide (Bi-58), 40% k.e. (dimetoat)	0.7-1.5	Leaf beetle, aphids, thrips	Spraying during growing season
Chlorophos, 80% tech., s.p. and micro-granulated (trichlorfon)	0.75-2	Grain beetles, shield bug, grain flies, grain moth, beet webworm	Ibid

TABLE 6

Preparation	Expend. Norm (grams per hectare)	Pest	Method for Using Preparation
Vakor, 97-99% tech.	90-120	Grey field mice	Placement of bait in crops, concentration of preparation in bait 3%, bait feed -- grain of wheat or sunflowers, expenditure of bait 4 kg per hectare
Gliftor, 72% tech.	5-10	Susliks	Concentrated placement of bait along edges of crops, in areas where susliks congregate; concentration of preparation in bait 0.3-0.6%, bait feed -- grain of oats, expenditure of bait 1.6 kg per hectare
	15-24	Grey field mice	Placement of bait in crops in areas where field mice congregate; concentration of preparation in bait 0.4-0.6%, bait feed -- grain of wheat and sunflowers, expenditure of bait 4 kg per hectare
	12-20	Water field mice	
Zinc phosphide tech.	45-400	Susliks	Concentrated placement of bait along edges of crops, in areas where susliks congregate
	290-320	Water field mice	Placement of bait in areas where field mice congregate; bait feed -- grain of soaked peas and succulent portions of plants, concentration of preparation in grain bait 8%, in succulent portions -- 5-6%, expenditure of bait 4 kg per hectare.
	150-400	Small mice-like rodents	Ibid, but the bait feed -- grain or wheat or sunflowers, concentration of preparation in bait 5-8%, expenditure of bait 4 kilograms per hectare

In some instances, when winter wheat is being cultivated over large areas, it is advisable for the crops to be treated by air using butyl ether 2,4-D, 72% tech. (0.4-0.7 liters per hectare) and also low volatility ethers 2,4-D C_6 - C_9, 52% tech. (0.6-1 liter per hectare).

All of the herbicides (with the exception of the granulated preparation 2,4-D and simazine) are employed during the tillering phase for grain crops; uniform

spraying with a working liquid expenditure of 200 liters per hectare for surface treatments and 25-50 liters per hectare for aviation treatments. It is recommended that minimal dosages of the preparations be applied during the early periods to intensively developing grain sowings.

Granulated acid 2,4-D is applied together with ammonium nitrate in a top dressing, simazine, 80% s.p. (0.3 kilograms per hectare) -- following sowing up until the winter crop seedlings in the nonchernozem zone; lontrel, 30% v.r. (0.16-0.66 liters per hectare), most effective in mixtures with post-seedline preparations of the Group 2,4-D for increasing their effect on sowthistle, matricary and bindweed species.

TABLE 7

Weed	Reduction in Yields With an Increase in Weediness	
	Per weed per m^2	For 1% of the Planned Soil Cover
Cleavers	1.16	0.69
Field speedwell	1.09	0.57
Wild radish	1.85	0.98
Chickweed	0.69	1.19
Black bindweed	1.79	0.54
Hemp nettle	1.47	1.09
Scentless mayweed	3.13	0.94
Field sowthistle	0.46	0.77
Common wild oats	0.26	0.61
Field silky apre	3.13	1.56
Meadow brome grass	0.26	0.70

The feasibility of chemical weed control work must be determined taking into account the actual weediness of plantings prior to the commencement of treatment and comparing it against the economic thresholds for weed damage, that is, the levels for weed contamination at which the crop losses in a cost evaluation exceed the expenditures for combating the weeds. Crop losses can be determined sufficiently accurately using experimental data, which reveals a reduction in grain crop yield with an increase in the number of weeds per unit (per weed per m^2) or the degree of weediness per 1% of planned cover (see Table 7).

The application of high norms of nitrogen fertilizer in the cultivation of winter wheat using an intensive technology raises the threat of plant lodging, which can be prevented through the use of growth regulators: TUR, 60 percent v.r. (3.3-3.6 liters per hectare) or Chlorcholinechloride, 97.5 percent tech. (2.1-4.1 kilograms per hectare), the spraying of which is carried out during the shooting phase. Use is also made of the practice of combining a top dressing of urea with a spraying of TUR and treating seed prior to sowing with TUR (8 liters per ton) or chlorcholinechloride (4.1 kilograms per ton).

In order to ensure repeated passes over a field by units when carrying out treatments, with a minimum risk of damage to the plants, a technological track

is created. In accordance with recommendations by VASKhNIL /All-Union Academy of Agricultural Sciences imeni V.I. Lenin/, it is 1,800 millimeters for unsown strips and 450 millimeters wide when DT-75 and T-74 tractors are ganged with three SZ-3.6 sowing machines or an SZP-3.6 hitched to an SP-11 or SP-16 unit. The width of the caterpillar tracts of the tractor is 390 millimeters. In order to leave unsown strips with a track of 1,800 millimeters, the 6th, 7th, 18th and 19th drill coulters on the sowing unit are disconnected. The sowing can be carried out using a single sowing unit with a Belarus' tractor. In both instances, the track is repeated every 10.8 meters. When carrying out protective measures, use is made of the OPSh-15 unit -- reequipped for the standard track by expanding it from 1,350 to 1,800 millimeters. The POM-630 unit can also be used for applying pesticides. In order for the swath of the sprayer to conform strictly to the width of the sowing unit, a portion of the spraying units to the left and right of the OPSh-15 boom must be disconnected. When spraying winter crops with insecticides and fungicides, it is recommended that use be made of centrifugal spraying units having a diameter of 1.2-2 millimeters and a working liquid expenditure norm of 200 liters per hectare, herbicides -- slot sprayers for a norm of 150-200 liters per hectare. The discharge slots are installed at an angle of 10°.

In order to evaluate the feasibility of individual methods and the complex of protective measures, it has been suggested that the possible expenditures for carrying them out and the anticipated result in the form of an increase in yield be taken into account. The degree to which the second indicator surpasses the first will reflect the soundness of the protective measures.

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NEED FOR IMPROVED TRAINING OF SCIENTIFIC PERSONNEL

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/Article by V.M. BAUTIN, chief of the Personnel Administration of the All-Union Academy of Agricultural Sciences imeni V.I. Lenin: "Problems in the Training of Scientific Personnel"/

/Text/ The conversion to intensive forms for the management of social production is imposing new personnel requirements upon the national economy and particularly with regard to the quality of their training. These problems are especially acute in the case of the agricultural science, since here as in no other sphere of social activity a great role is played by the personnel. The solutions for many tasks associated with the implementation of the Food Program are dependent upon their professional competence and creative endeavors.

The scientific institutes of the All-Union Academy of Agricultural Sciences imeni V.I. Lenin have at their disposal a powerful scientific-technical potential. Eight regional and ten branch departments of the academy have 130 scientific-research institutes under their jurisdiction, with more than 19,000 scientific workers assigned to these institutes -- 607 doctors and approximately 930 candidates of science. Today, one out of every four individuals performing scientific or scientific-teaching work in agriculture is working at a scientific institute of VASKhNIL /All-Union Academy of Agricultural Sciences imeni V.I. Lenin/.

An increasing amount of concern is being displayed for the quality of our scientific-teaching personnel and to their proper distribution among the country's zones. It is here that we encounter certain problems.

In 1983, approximately 50 percent of the scientific personnel in the ASKhNIL system possessed scientific degrees of either doctor or candidate of sciences. However, since 1970 the proportion of doctors of sciences compared to the overall number of scientific personnel has decreased and in 1983 it amounted to 3.1 percent. This same tendency applies to acientific-research institutes of the USSR MSKh /Ministry of Agriculture/ on the whole.

Scientific personnel of the highest classification are unevenly distributed among regions of the country. For example, the smallest number of doctors of sciences is found in the Siberian Department of VASKhNIL -- one per institute

and in the eastern and all-Russian departments -- two per institute. Over the past two five-year plans, not one doctor of sciences has been added at 52 scientific-research institutes of the USSR MSKh.

Substantial changes have taken place in the rates of growth in the number of doctors of sciences within the same branch. The greatest increase in their number took place in the economic sciences -- an increase by a factor of almost 10 and in the veterinary and technical sciences -- an increase of more than twofold. The number of doctors of sciences in the biological sciences increased only negligibly -- by a factor of 1.5 and in the agricultural sciences -- by a factor of 1.8.

Over the past five-year period, a considerable change has been noted in the structure of scientific personnel in terms of age. This trend has manifested itself very clearly in recent years, with a noticeable reduction taking place in the rates of growth in the number of scientific personnel. In 1982, a large portion of the doctors of sciences were persons ranging in age from 50 to 60 years -- 45.5 percent, whereas in 1972 their proportion was only 21 percent. At the present time, more than 80 percent of the doctors of sciences are older than 50 years of age.

This trend will become even more pronounced over the next 10-15 years. Thus a serious problem is arising at the present time with regard to regulating the age structure for doctors of sciences and attracting youth into science.

The personnel structure for scientists working on plant protection problems is of definite interest. Using ten scientific-research institutes for plant protection as an example, an analysis was carried out on the work of scientific workers from the standpoint of both quality and quantity. It was discovered that the same regularity that applies on the whole to the agricultural sciences also holds true for the specialty "Phytopathology and Plant Protection." From 1970 to 1983, the number of scientific personnel attached to this profile increased by a factor of 1.2, including doctors of sciences -- by a factor of 1.25 and candidates of sciences -- a factor of 1.4. In 1983 the proportion of doctors of sciences was 3.2 percent and this was considerably less than the figures for the biological, veterinary and economic sciences. Compared to 1970, when the proportion of doctors of sciences older than 60 years of age was 15.7 percent, in 1983 -- more than 55 percent. In an absolute sense, the number of doctors of sciences in this age group increased by a factor of 4.4. And this means that continuity in the training of scientific personnel of the highest classification is being disrupted.

The existing system for training scientific personnel through graduate work is inadequate. Graduate work is available at 84 scientific research institutes and almost 3,000 individuals (one third with leave from work) are carrying out such work in 60 specialties. The greatest amount of graduate work, involving groups of more than 100 individuals, is to be found at such institutes as the VNII /All-Union Scientific Research Institute/ for field crop husbandry imeni Vavilov, VNIIZR, VNII for Livestock Husbandry, VNII for Agricultural Economics and the VNII for Veterinary Science. One fourth of the institutes have a low number of graduate students -- less than 20 individuals.

Fine graduate work is being carried out at the VNII for the Breeding and Genetics of Agricultural Animals and at the VNII for Helminthology imeni K.I. Skryabin. Here more than 70 percent of the graduate workers are joining the army of scientific workers. The greatest success is being realized in training provided in the veterinary, economic and biological sciences and the least success -- technical and agricultural sciences. This is associated not only with the raised requirements for the carrying out of scientific work. The percentage of those who complete graduate work or who defend dissertations is dependent upon the level of professional and general preparation for scientific work possessed by those commencing graduate work, upon their ability to report the results of scientific studies in an intelligent manner, upon thorough knowledge of a foreign language, high exactingness and attention on the part of scientific leaders and also the leaders of subunits with regard to the graduate students, the timely approval and coordination of themes, the early certification of candidates with a mandatory review and discussion of their scientific activity and even upon concern being evidenced by the management of the institutes for the graduate work being carried out. Great importance is attached to the ability to single out talented specialists for further training; this path must be closed to individuals who possess only average capabilities. In order to achieve this, a more flexible and dynamic system for training scientific personnel must be created, one which will be more in keeping with the modern requirements for scientific-technical progress.

First of all, it will be necessary to develop a method for determining the optimum requirements for scientific personnel. Whereas the training of candidates of sciences is on the whole organized and planned, each "delivery" of doctors of sciences is the result of the self-education of a scientific worker. Based upon a system of observations and analysis of the status of scientific workers, the scientific institutes must develop long-range plans for the preparation of doctoral dissertations, coordinating their themes thoroughly in the interest of eliminating duplication and parallelism.

The experience of past years has shown that the optimum scientific collective is one in which scientific personnel and young scientists are represented to a like degree. Thus the principal element of personnel policy for both the immediate and distant future must be work carried out aimed at ensuring the required structure for experienced and young scientists and for their stability and continuity.

In order to achieve continuity, more extensive use must be made of the practice of encouraging scientific personnel, particularly doctors of sciences who have reached retirement age, to participate in studies as consultants.

For the purpose of carrying out successful work in the preparation of doctoral or candidate dissertations, promising specialists engaged in scientific studies at NII's /scientific research institutes/ or performing scientific-administrative or organizational work should be assigned on a temporary duty basis, with retention of their wages, to leading scientific institutes, centers and VUZ's, for a period of up to 2 years in order to complete their work; scientific probationary work should be carried out in a systematic and purposeful manner in both socialist and capitalist countries; active use should be made of creative vacation periods, increasing their duration to 1 year for

completing work on a doctoral dissertation and up to 6 months for a candidate's thesis. In addition, a program for working towards a doctor's degree must be made available within the VASKhNIL /All-Union Academy of Agricultural Sciences imeni V.I. Lenin/ system.

Greater prestige must be attached to graduate work and the period of time spent in carrying out such work must be added to one's period of scientific service. For persons who have successfully completed such work, the period of instruction should ideally be extended if this is required in connection with obligations, as a result of which tests should be repeated (natural calamities, loss of animals or plants) and with the payment of an allowance. For some specialties, the period of instruction for graduate work should be increased to 4 years through the introduction of annual probationary work (probationer-researchers). Ideally a review should be undertaken of the problem concerned with improving the conditions and material incentives for young specialists from kolkhozes and sovkhozes who are undertaking graduate work; they are entitled to the wages of an assistant or junior scientific worker.

The time is at hand for establishing the post of head of graduate students at all NII's and VUZ's where graduate work is carried out. The work performed by such individuals should be included in their scientific-teaching length of service record.

The scientific instructors play a leading role in raising the operational efficiency of graduate work. By no means are all of them devoting sufficient attention to this very important problem. A requirement exists for a more thorough selection of scientific instructors, advancing only talented scientists for carrying out this work. In order to raise their responsibility, the system for providing payments for the scientific instruction of graduate students should ideally be defined more precisely, with such payments being made after the graduate students have defended their dissertations or once annually following a positive certification of the graduate students.

Importance is attached to defining the system for developing the themes for dissertation studies and exercising control over it, such that there will be no doubt concerning the urgency or need for each candidate dissertation. Moreover, under this system a theme will be approved not for a doctor or candidate of sciences but rather for a problem or "bottleneck."

An improvement in the qualitative structure of scientific personnel and in their training will make it possible to raise the overall level of their studies considerably and to satisfy the requirements now confronting the agricultural science and production.

7026
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IMPROVEMENTS IN TRAINING FOR PLANT PROTECTION SPECIALISTS REQUIRED

Moscow ZASHCHITA RASTENIY in Russian No 1, Jan 85 p 20

/Article by K.V. Popkova, professor and head of the Phytopathology Department: "In The Phytopathology Department"/

/Text/ The decree of the CPSU Central Committee and USSR Council of Ministers entitled "Further Development of Higher Schools and Raising the Quality of Specialist Training" contains the following requirement: "Ensure that the lectures are problematical in nature, reflect the vital problems of theory and practical experience and the modern achievements of social and scientific-technical development and promote intense independent work." In carrying out this decree, the Department of Phytopathology at TSKhA /Timiryazev Agricultural Academy/ is devoting special attention towards ensuring that the students are equipped with the knowledge and skills required for work under the conditions associated with the intensification and concentration of agricultural production.

The department's teaching collective has developed problematical lectures for the principal course subjects and it has prepared graphic aids which demonstrate the symptoms of the more widespread diseases of agricultural crops. During laboratory and practical exercises, the students are able to familiarize themselves with the various methods available for combating plant diseases.

Wherever a future graduate of the academy works -- be it in production or at a scientific institute -- he must be able to operate on the basis of knowledge obtained at the TSKhA and constantly supplement this knowledge. However perfect the training process might be, it is incapable of furnishing prepared solutions for all of life's situations. Thus, within the walls of a VUZ, importance is attached to teaching the students how to think creatively and how to find the correct solutions for various situations they encounter.

In the formation of unique reflection, great importance is attached to NIRS /nauchno-issledovatel'skaya rabota studentov; scientific-research work of students/. The students are drawn to scientific research work commencing with their first days of instruction. A strong experimental base is available for this: hothouses, field sector and a laboratory. The students carry out their scientific experiments and tests throughout the year. The principal goal of the department's teachers is to arouse interest in the problem under study, to accustom their students to searching for means for improving the protective

methods and to reveal the opportunities and prospects available for lowering crop losses. The subject program of studies carried out by the department is extremely diverse. It encompasses a broad complex of phytopathological problems, including a study of virus, fungus and bacterial diseases of various agricultural crops. It is interesting to note that in addition to teachers, scientific workers and graduate students, other students also participate actively in this work.

Scientific research work is being carried out at TSKhA both within the framework of the training program and also during extracurricular time. All students participate in the first form. The scientific research work included in the training schedule is directed towards mastering the methods for phytopathological studies (methods for pure cultures of pathogens, diagnostics for pathogens of virus, fungus and bacterial diseases, methods for the artificial infection of plants and so forth). Such work expands the knowledge of disease pathogens, it develops the ability to identify diseases and it intensifies professional knowledge. Studies following exercises are carried out in a phytopathological group of an SNO /studencheskoye nauchnoye obshchestvo; student scientific society/. When participating in this society, the students select their own themes and thereafter develop them under the guidance of a teacher. They report the results of their studies in reports delivered before a student conference. The data obtained during a study of the theme selected can be used for writing course work or it can be included in a section of a diploma thesis.

It is difficult to exaggerate the value of NIRS with regard to the development of plant protection specialists. But we attach equal importance to the link existing between research study and practical work. Here is an example of just how this is organized in our department. Potato planting stock which has been sanitized with the aid of students is turned over to TSKhA uchkhozes /training farms/, where the students carry out observations on the status of the crop during practical work, conduct a comparative evaluation of the plantings and determine the economic effectiveness of the sanitation work. The participation by the students in research work that is directly associated with production aids them in the writing of diploma theses, which as a rule contain information that is of specific value to agriculture. The students perform practical work commencing with the very first days and continuing right up until the end of training -- at the uchkhoz, the experimental station, the scientific research institute and finally at the sovkhoz or kolkhoz, where they prepare their diploma work, the theme of which is directly associated with the production tasks. It is by no means an accident that each year more than 60 percent of the diploma works are recommended for introduction into operations by the state examination committee.

The process of developing a specialist does not end with the completion of training at a VUZ. Rather it continues in an active manner at a kolkhoz, sovkhoz or in a laboratory. The department's teachers continue to devote attention to their students even following the completion of training. The instructor for a diploma project becomes an instructor for an apprentice-graduate. The practice is followed at the TSKhA of holding meetings with graduates of past years, during which interesting exchanges of opinions take place between the students, teachers and young specialists. It is pleasant to

note that our graduates work in conformity with the state distribution and that they adapt well in their collectives. Unfortunately, a biased attitude is still being observed from time to time in production, with a protector of plants being viewed only as a specialist in the use of the chemical method. And indeed a plant protection agronomist is an individual who is fully capable of employing all of the processes used in field crop husbandry. Indeed the problems of integrated protection are solved during each stage in the production of agricultural products, commencing with the preparation of soil and sowing and ending with the harvesting and storage of the crop.

The collective of the Department of Phytopathology at the Moscow Agricultural Academy imeni K.A. Timiryazev is constantly improving the training process and devoting all of its efforts towards the training of well educated plant protection personnel, individuals who will be capable of providing reliable protection for the crops.

7026
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MEASURES FOR REDUCING ADVERSE EFFECTS OF PLANT PROTECTION AGENTS

Moscow ZASHCHITA RASTENIY in Russian No 1, Jan 85 pp 22-24

/Article by V.F. Samersov, director of BelNIIZR and A.F. Skur'yat, deputy director: "Natural Plant Protection Technology"/

/Text/ The use of protective measures in Belorussia is making it possible to harvest additionally from each hectare an average of 2-3 quintals of grain, 1-1.5 quintals of flax fiber and 40-60 quintals of potatoes, sugar beets and fruit and vegetables. This constitutes a worthy contribution towards carrying out the Food Program. However the carrying out of work concerned with combating plant pests and diseases and weeds raises a need for constantly displaying concern for the safety of the surrounding environment and the integrity of agrocoenosis. A great deal is being accomplished in this regard.

The planning of measures for protecting plants throughout the republic is being carried out based upon an annually prepared forecast on the appearance of pests and diseases, the mapping of field weediness and a computation on the economic effectiveness and feasibility of measures carried out against a high agro-technical background. Thus the use of data for a long-term forecast, corrected by short-term data, makes it possible to optimize the volumes and frequency of chemical treatments carried out against such a dangerous potato disease as phytophtora. As a result, during years considered to be unfavorable for its development, the number of treatments is reduced by 1-2.

An important element in the system of protective measures is the use of economic thresholds for the pests, diseases and weeds that are specific for each climatic zone and crop. Criteria have been established or defined more precisely in the republic with regard to the numbers of dangerous and harmful objects posing a threat to the principal agricultural crops. Practical workers employ these thresholds when determining the feasibility of carrying out protective measures (see Table). Work carried out on the basis of these thresholds makes it possible to limit the use of pesticides and employ them in a more efficient manner and with less danger to the surrounding environment. For example, consideration of the weather conditions and the economic thresholds for damage caused by the Colorado potato beetle made it possible, during the 1975-1979 period, to reduce the volume of treatments carried out against this pest in the republic on 707,000 hectares and to realize a savings of approximately 1,400 tons of insecticides.

Experience has shown that these criteria must be constantly refined and improved, taking into account the level of agricultural practices, the varietal characteristics of the plants and so forth. For example, the economic threshold for harm caused by the Colorado potato beetle on potato plantings that was developed earlier -- 5 percent of the infested bushes -- was raised to 10 percent or more of the infested bushes, with 20 or more larvae per bush. Such an opportunity appeared following the introduction into production operations of new potato varieties of the intensive type having an intensified regeneration leaf capability and an improvement in the agrotechnical background for cultivating the crop.

Among the methods for integrated protection, a great role is played by the cultivation of varieties which are immune to pests and diseases. In Belorussia, this makes it possible to reduce the use of chemical protective agents by a factor of 5-15 (N.A. Dorozhkin, A.L. Ambrosov, 1978) and to reject their use completely when combating canker. Our computations indicate that the introduction of such potato varieties as Prigozhiy 2, Meta, Kristall and others, in combination with the alternating of crops in a crop rotation plan, will ensure protection against the potato nematode in the absence of nematicides.

The development and introduction into agricultural production of potato varieties possessing field immunity to phytophtora will play a great role in lowering the frequency of chemical treatments and reducing the adverse effects on the soil microflora and other objects of the surrounding environment.

Economic Thresholds for Harm Caused by Insects (BSSR)

Grain Crops

Swedish-fly. 20-25 flies per 100 sweeps of an insect net during the phase of grain crop seedlings. 40-45 flies per 100 sweeps of an insect net during the 3-leaf phase of spring grain crops.

Click beetles. More than 12 larvae per m^2 (on mineral soils), more than 20 larvae per m^2 (on peat soils) prior to sowing the crop.

Large greenbug. 3-5 bugs per ear during colonization of 60 percent of the plants during the blossoming phase for spring grain crops.

Grain thrips. 10 adult specimens per stalk for colonization of 75 percent of the plants, at commencement of shooting phase.

Leaf beetle. 8 beetles or more per m^2 during shooting phase or 1 larvae per stalk for colonization of more than 50 percent of the stalks.

Potatoes

Colorado potato beetle. 20 larvae per plant for a colonization of more than 10 percent of the bushes during the budding phase to the commencement of blossoming.

Flax

Flax flea. 15-20 beetles per m^2 during the crop seedling phase

Sugar Beets

Opaque carrion beetles. 1-2 beetles per m^2 during crop seedling phase.

Flea beetle. More than 10 beetles per m^2 during beet seedling phase.

Spinach leaf miner. 10-20 eggs per plant during phase of 3 true leaves.

Beet aphid. 10-15 specimens per plant.

Cabbage

Cabbage maggot. 6-10 eggs or 5-6 larvae per plant for 5-10 percent colonization of plants during leaf verticil phase; 7-8 larvae per plant during head formation phase.

Cabbage moth. 1-3 caterpillars per plant for 5 percent colonization of early cabbage plants during head formation phase.

Diamond back moth. 2-5 caterpillars per plant for 10 percent colonization of plants during leaf verticil phase.

Apples

Apple worm. 2-5 eggs for 100 percent fruit or 2-3 percent damaged fruit during phase of young fruit formation.

Brown apple mite. 5-10 eggs per fruit spur in the spring prior to the commencement of growth.

Red apple mite. 500-1,000 eggs per linear meter of branch in the spring prior to the commencement of growth.

Green apple aphid. 4-10 eggs per 10 cm of shoot up until opening of the buds.

Apple sucker. 5-7 eggs per fruit bud or 200-300 eggs per linear meter of branch in the spring prior to opening of the buds; 4-8 larvae per bud during phase of "advancement" of buds.

Seven-dot ladybug. 400-600 remales per 2 linear meters of branch prior to opening of the buds.

A high degree of effectiveness in campaigning against plant pests and diseases and weeds can be achieved only in the presence of good agricultural practices, the timely and high quality carrying out of all technological operations associated with tilling the soil and applying nutritionally balanced mineral and organic fertilizers, the alternation of crops in a crop rotation plan, timely preparation of seed, sowing work carried out during the best periods, correct tending of the plants and timely harvesting of the crops. By way of an example, we can cite a number of the republic's farms: the kolkhozes imeni Gastello in Minskiy Rayon, imeni Kalinin in Nesvizhskiy Rayon, Progress and Put' k Kommunizmu in Grodnenskiy Rayon, imeni Krasnaya Armiya in Vitebskiy Rayon, imeni Dimitrov in Tolochinskiy Rayon, Osnezhitskiy in Pinskiy Rayon,

imeni 22nd S"yezda KPSS in Gomelskiy Rayon, imeni Dzerzhinskiy in Bobruyskiy Rayon, Rassvet Sovkhoz in Brestskiy Rayon and others, all of which obtain high yields annually.

In particular, we would like to emphasize the phytosanitary role played by crop rotation plans in which a scientifically sound system for alternating crops promotes the creation of favorable conditions for crop development and unfavorable conditions -- for harmful objects. Specialized crop rotation plans aimed in particular at combating the potato nematode are being developed in the BSSR. The use in a crop rotation plan of crops that have not been damaged by the nematode, combined with the cultivation of a nematode-resistant variety, is making it possible to remove 97-98 percent of the cysts from the soil (A.L. Ambrosov, L.A. Sokolova, I.Ya. Ponin, 1980).

A concentration of a crop in a crop rotation plan leads to an accumulation of pathogens. Thus, when crop rotation plans are saturated with grain crops, an increase (sometimes by twofold) takes place in the degree of infection by root rots and in the case of flax -- infection by fusarial wilt and bacteriosis (V,F, Samersiv, S,F, Byga, 1978). In this regard, when establishing the level of concentration for one crop in sowings, the crop selected should be such that the complex of measures for combating harmful objects will produce a high degree of economic effectiveness and prevent crop losses, while not adversely affecting the surrounding environment. According to data supplied by BelNIIZR, for example, crop rotation plans can be saturated with grain crops up to 60-67 percent and with flax -- up to 12-14 percent (V.F. Samersov, 1983).

Individual agrotechnical methods are also of importance. During the development of an all-round system for protecting grain crops at BelNIIZR, an evaluation was carried out on the effect of soil cultivation, mineral fertilizer applications and sowing schedules. Two-stage disking of stubble with subsequent deep autumn plowing lowered the number of click beetles by 60 percent and an application of mineral fertilizers (ammonium nitrate, superphosphate and potassium chloride) to the soil carried out over a period of 3 years -- by 65 percent. At the same time, an application of mineral fertilizers which were not balanced in terms of nitrogen and phosphorus promoted a sharp increase in the number of and harm caused by suctorial insects (aphids, thrips, cicadas) and an increase in the damage inflicted on barley by root rots.

It has been established that the sowing schedules for spring and winter grain crops play a tremendous role in ensuring a normal phytosanitary status for sowings. Thus, very late sowing schedules for winter crops lower sharply the damage caused to plants by grain flies, aphids, thrips and root rots. For example, during our tests, winter rye sown on 30 August sustained 58 percent damage caused by larvae of the Swedish fly, 10 September -- 38 percent and 20 September -- 14 percent damage.

From an agrotechnical and protective standpoint, the most acceptable sowing schedules for spring grain crops are very early schedules (prior to 30 April) -- in our experiments, 1-2 percent of the stalks were damaged by the Swedish fly and in the case of later periods (7-15 May) -- from 22 to 49 percent. With late sowings, the contamination of barley by root rots increased from 14 to 25 percent.

As you can see, a natural-protective system for grain crops makes it possible to lower the degree to which pesticides harm the biosphere.

Since pesticides still play a great role in the modern technologies for protecting agricultural crops, importance is attached to ensuring their effective and safe use in an optimum combination with other methods and resources.

Tremendous importance is attached to the formation of an assortment of chemical plant protective agents which will be highly effective against pests, phytopathogens and weeds and at the same time safe for humans, warm-blooded animals, useful fauna and flora and other objects. The most acceptable preparations are those which have a short or moderate period for providing protection for plants, soil and other objects and which do not exceed one growing season. In addition, pesticides from the various chemical groups must be alternated systematically in order to prevent the development of immune forms of pests, phytopathogens and weeds. This requirement is met by a large group of phosphoro-organic pesticides (valekson, sayphos, phtalophos, phozalon, chlorophos, bazudin and others) and by synthetic piretroides (ambush, ripcord, detsis, tsimbush, rovikurt and others), the residues of which do not remain in the soil for more than 20-40 days.

In the interest of reducing the negative effects on useful entomofauna by pesticides, importance is attached to defining the optimum periods for providing treatments, when the number of harmful types is approaching its maximum and that for useful types -- a minimum figure.

Such periods, for example, were established by BelNIIZR in potato agrocoenosis for the Colorado potato beetle and its entomophages. A maximum number of this pest appears in the zones of mass colonization towards the end of June and up until the first 10 days in July and its entomophages appear from late July and into the beginning of August.

The selection of the plant protective agents to be used is of great importance for maintaining the number of parasitic and predatory insects. Thus the preparation sayphos, which is highly toxic for aphids and for their entomophage the seven-spot ladybug, is several times less dangerous than chlorophos, sevin, dilor and others.

Studies have shown that the biological preparation bitoxybacillin and its component part -- heat-proof ekzotoxin -- are relatively harmless for the entomophages of the Colorado potato beetle, whereas common golden-eye flies, the seven-spot ladybug and chlorophos are highly toxic for them. Entobacterin is less dangerous than chlorophos for useful insects in a fruit orchard (I.T. Korol', N.I. Mikul'skaya, 1978; A.I. Moiseenko, L.V. Barybkina, 1979). These peculiarities of pesticides must always be taken into account when selecting a particular type.

Since regardless of the plant protection method employed, a portion of the pesticides falls directly onto the soil, tremendous importance is attached to evaluating the effect generated by the chemicals on the microflora and the biological activity of the soil. Laboratory and field studies carried out at BelNIIZR have shown that the effect generated by pesticides on microflora is dependent upon the chemical nature of the preparations, the number of treatment repetitions, the expenditure norm per unit of space and upon the specific structure of the microorganisms.

Thus a one-time treatment of potatoes with dilor (0.4 kilograms per hectare) did not have any substantial effect on the group structure of the soil microflora, whereas a two-stage treatment decreased the overall number of microorganisms using mineral forms of nitrogen and also actinomycetes, tsellyulezniks and nitrificators.

The soil herbicides arezin, linuron and propazin, applied over a period of 60 days to spinning flax on sod-podzolic medium loamy soil suppressed the development of microorganisms of all groups and especially severely -- ammonificators and nitrificators -- and to a lesser degree they inhibited mould funguses, actinomycetes and microorganisms which utilize mineral forms of nitrogen. After 75 days, the effect of the herbicides on the microorganisms was weakened noticeably and after 100 days (prior to harvesting the flax) it terminated completely (A.P. Molchan, K.P. Padenov, A.S. Andreyev, 1976).

However, a majority of the pesticides used in agriculture, with the technology for their use and the expenditure norms being observed in a strict manner, do not have a prolonged effect on the microbiological processes taking place in the soil. As a rule, they are temporary and reversible in nature.

Unfortunately, the modern assortment of preparations is such that it is not always possible to solve the problems of plant protection without resorting to the use of substances which are persistent in the soil. For combating weeds in corn plantings, for example, extensive use is being made of herbicides of the sim-triazinovaya group (simazin, atrazin and their mixtures). Studies carried out at BelNIIZR have shown that 1 year following the application of simazin, atrazin and propazin in behalf of corn, they were detected in the soil (depending upon the norm) in the percentages of 16-24, 11-18 and 36-67 percent respectively of the quantities applied. The complete degradation in the soil (within the sensitivity limits for the methods of analysis), for application norms of 2 and 4 kilograms per hectare, occurred only after 16 months. When simazin was used in a norm of 8 kilograms per hectare, its residual amounts were detected in the soil over a period of 3 years. In this regard, when sowing various crops following corn, a need always exists for checking upon the phytotoxic residual effect of herbicides of the sim-triazinovaya group and also for developing PDK /maximum permissible concentrations/ for soil pesticides for sensitive crops in accordance with the indicator for phytotoxicity. Such PDK's for medium loamy soils have been prepared in Belorussia for oats, winter rye, lupine and sugar beets.

Experience has shown that phytotoxicity PDK's must be developed for all promising soil herbicides and in accordance with the toxicological indicator -- for all pesticides as well.

Methods for improving the use of the preparations include their all-round use against various harmful objects and carrying out treatments using mixtures of pesticides for the purpose of expanding the spectrum of their action: border and local spraying, application of granulated and other new preparation forms.

For Belorussian conditions, a high technical and economic effectiveness has been established for herbicide-insecticide mixtures for combating grain crop pests and weeds, insecticide-fungicide mixtures -- for combating the Colorado

potato beetle and late blight of potatoes, border treatments -- aphids and grain thrips on grain crop plantings, granulated insecticides -- against click beetles on grain crop sowings and against pests of cruciferae family seed plants, differentiated (depending upon the extent of infection) norms for chemical disinfection and disinfection mixtures -- against root rots and loose smut of barley.

Thus, herbicide-insecticide mixtures applied to grain crops under production conditions ensured the destruction of 90-93 percent of the weeds and lowered the damage caused to barley by the Swedish fly by a factor of 3-4. The increase in yield amounted to 2.1-4.7 quintals per hectare. The introduction of this method into the republic, on an area of more than 40,000 hectares, produced an economic effect of more than 942,000 rubles. During production tests carried out in Luninetskiy Rayon in Brest Oblast (1981), an application of bazudin to the soil destroyed 89 percent of the click beetles, lowered the damage caused to the plants by them by 98 percent and raised the grain yield by 14.2 quintals per hectare.

One element of integrated protection is the use of biological agents. In Belorussia, such agents have been approved for use against the Colorado potato beetle, the apple moth and leaf-chewing pests in orchards and on cabbage, potato scab -- on apples, cucumber diseases and the spider mite in greenhouses. A biological method for combating the greenhouse whitefly is being developed.

However the extensive use of the biological method in practical work is still limited owing to insufficient industrial production of the biological preparations and the absence of a technology for the mass breeding of a number of entomophages.

A great amount of work is being carried out throughout the republic in connection with the use and protection of useful insects. Many types of predatory and parasitic fruit orchard insects have been isolated and the role they play in limiting the numbers of pests defined. For example, it has been established that up to 88 percent of the apple moths are destroyed by 26 types of parasitic and predatory insects, the number of moths is lowered by 25-30 percent; leaf rollers are destroyed by 43 types of entomophages and their number is lowered by 30-50 percent (A.N. Kustova, V.V. Bolotnikova and others, 1978).

When developing plant protection technologies, one should take into account the regulating activity of local types of useful insects, create favorable living conditions for them and define more precisely the criteria for the ratio between pests and entomophages, in connection with which it may be possible to abolish or limit the use of destructive measures.

It is possible to use chemical plant protective agents that are harmless to the surrounding environment by exercising well organized operational control over observance of the expenditure norms for the preparations, the working solution concentrations, the levels for residual amounts of pesticides in the plants, soil and water, over the established periods for waiting and so forth. Such control is being provided throughout the republic by control-toxicological laboratories and groups of toxicologists from Belsel'khozkhimiya oblast stations for the use of chemical processes and by sanitary-epidemiological stations. The regulations for the safe use of new preparations and the methods

of analysis are developed in a laboratory for pesticide dynamics of BelNIIZR. It exercises selective control over the residual amounts for individual pesticides.

Special organizational-economic and protective measures are being developed for preventing the contamination of a specific number of natural protection territories, for example the basin of Lake Naroch'.

The mentioned measures are making it possible to lower the adverse effects of plant protective agents on objects in the surrounding environment. For the future -- a conversion over from methods for combating harmful objects to methods for controlling the phytosanitary status of agrocoenoses.

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ECONOMIC THRESHOLDS FOR PLANT DAMAGE BY INSECTS

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/Article by B.A. Areshnikov, head of laboratories at UkrNIIZR, M. G. Kostyukovskiy, junior scientific worker and N.F. Goncharenko, senior scientific worker:
"Problems With Development and Use of Economic Thresholds"/

/Text/ Many adverse aspects of the use of chemical means for protecting plants are associated not so much with their nature as they are with unsound or unwise use in a specific situation. As is known, up until recently the strategy and tactics for the use of chemical processes were aimed mainly at suppressing the number of pests to the maximum possible degree. At the same time, use of the chemical method precludes the possibility of achieving a stable prophylactic effect. This is borne out by many years of foreign and domestic experience. In addition, the desire to achieve a maximum suppression of the pests has been accompanied by global use of pesticides with high norms and expenditures and, it follows, with an increase in the threat they pose to the surrounding environment. All of this has raised the need for a review of the strategy and tactics for combating harmful organisms.

In our opinion, the principal essence of such a review lies in the fact that at the present time the use of pesticides is aimed mainly at protecting plants and not suppressing pests to the maximum possible degree. In addition, more and more recognition is being given to the principle of regulating their numbers: lowering them to economically imperceptible levels. And this is creating real prerequisites for use of the chemical method as an element for controlling agricultural systems and it is making it possible not only to protect sowings but also to maintain the biocoenotic relationships at a favorable phytosanitary level.

One condition for carrying out this program is that of calculating the economic thresholds for damage caused by insects. It should be emphasized that the importance of these thresholds goes far beyond the matter of determining the feasibility for carrying out treatments. The very fact of recognition of the thresholds for damage is in itself a type of theoretical prerequisite for the formation of a basically new approach for improving the chemical method; it is creating real prerequisites for replacing the total use of insecticides with local use and, it follows, it is reducing the threat to the surrounding environment by the adverse effects of the insecticides.

When developing the thresholds, one must possess a clear notion as to the nature of a threshold. Literature provides various definitions. For example,

V. Shtern (V. Stern and others) believes that an economic threshold represents the pest population density at which pest control work should be started, since a further increase in the number of pests could result in the economically permissible level of crop losses being exceeded. For a long period of time, the economic threshold for damage was considered to be that pest population density at which the expenditures for controlling the pest were reimbursed by the crop yield (Edward, Heath 1964; Byrne, 1966; S. Zincoln, 1968; E. Sylven, 1968 and others).

According to V.I. Tanskiy, whose opinion is widely expressed in domestic literature (1977, 1978, 1979, 1980, 1981), the economic threshold is that population density of a harmful species or degree of damage to plants at which perceptible economic harm is sustained by a crop. In a recent definition, the researchers stated that the economic threshold was that pest population density at which chemical control work begins to produce results and brings about an increase in production profitability.

Although the definitions for economic threshold of damage vary considerably, nevertheless they have a common character: they are based upon economic considerations. It is for this reason that the threshold for damage to plants is referred to as being "economic." The term was first proposed for use in the U.S.A. (V. Stern and others, 1959). In developed capitalist countries, it has become the chief criterion for the feasibility of pesticide use. For the most part, such an approach is conditioned by the very nature of the capitalist system. In our state, owing to its social nature, this feasibility, in addition to the economic aspect, is determined by the need for satisfying to the maximum possible degree the population's requirements for full-value food products and for protecting the surrounding environment against contamination. Hence the thresholds must be developed taking into account not only the economic but also the ecological, sanitary-hygienic and social criteria. Thus the threshold should be understood to mean that level for the number of pests at which economic, ecological and social control is deemed advisable. And this means that the term "economic" threshold of harm or damage reflects only one aspect and thus requires further definition. We are of the opinion that use should be made of the term "threshold (or criteria) of pest strength for the purpose of carrying out control work."

A starting point for the development of thresholds will be the level of reimbursement for expenses. It must be established, as already stated, in coordination with the economic, sanitary-hygienic and social advisability for carrying out control measures. The taking into account of all of these circumstances will be a difficult task and yet it must be solved by specialists representing many profiles.

As is known, the control methods, especially the biological and chemical methods, are by no means the same in terms of their effect upon the surrounding environment. Hence the development of the levels of reimbursement for expenditures and the thresholds for the numbers of insects must be differentiated taking into account the methods and agents used. Unfortunately, such an approach is still not available and thus we are unable to achieve a scientifically sound solution for the problem of developing thresholds.

In literature there are various points of view regarding the level of reimbursement for expenditures. Some authors believe that the value of the crop protected must equal the expenditures for chemical control (C. Lincoln, 1968; E. Sylven, 1968); others advocate twofold reimbursement (R. Dierekes, Ch. Heye, 1970; H. Steiner, 1970; H. Chilang, 1973) and even five-fold (N.M. Golyshin, G.C. Kukalenko, 1966).

V.I. Tanskiy (1977, 1980) believes that chemical control is advisable when the pest strength is sufficient for causing 3-5 percent losses in a crop. However, this approach overlooks fluctuations in the yields for the same crop and this signifies a great variation in the reimbursement for expenditures. Thus a winter wheat yield, by cultivation zones and within the borders of the same farm, may fluctuate from 10-15 to 50-60 quintals per hectare and the permissible losses in crop -- from 0.5 to 3 quintals per hectare. Such a range in fluctuations underscores the fact that the relative indicator for crop losses is unacceptable for developing the economic thresholds.

Analysis has shown that we still do not have a firm or sound level of reimbursement for expenditures in connection with the use of pesticides and that an urgent need exists for its development. During a given stage, the levels for the feasibility of use of chemical agents in connection with the reimbursement for expenditures should be established, even if only roughly, for the various crops. We assume that for cereal grain crops it must be not lower and even somewhat higher than reimbursement for the use of other chemical means, particularly fertilizers.

According to data supplied by the Ukrainian Institute of Economic and Agricultural Organization (S.G. Krishtap), the reimbursement for the use of fertilizers on grain crops in the UkSSR amounts to a factor of 1.8-2.2. We believe that the reimbursement for chemical protection here must be not less than a factor of 3. The thresholds for the numbers of grain crop pests were developed by us based precisely upon this level.

Based upon the biocenological principles for the use of chemical agents, in addition to the economic thresholds for damage, extreme importance is also attached to establishing those levels up to which a reduction in the number of insects is deemed advisable.

A number of researchers (V.I. Tanskiy, 1981; A. Davidson, R. Norgaard, 1973) identify this indicator with the threshold level for number of pests. However, a contradiction is found in this approach. If the goal of chemical control over harmful organisms is to lower their number to the level of the economic threshold of damage, then what sense does it make to use active protective agents at this same threshold level? Based upon the peculiarities of the damage inflicted and the seasonal dynamics of the pests, we assume that the level up to which a reduction is required in their number must be lower than the economic threshold.

This level is dependent upon many factors and mainly upon the peculiarities in the development of the pests and the host-plants. The higher the rate of increase in the number of pests and the longer the vulnerable phase of plant development, the lower will be this level. And conversely, a rapid recovery of plants from damage and a high plant regenerative capability make it possible to be guided by a higher level for insect strength. Unfortunately, this problem is for all practical purposes not being studied and this is seriously hindering improvements in the chemical protection of plants.

A study of the harm caused by insects serves as the basis for determining the strength thresholds. In the case of cereal grain crops, analysis reveals that it is dependent upon a broad complex of factors and particularly upon the number, age structure and level of viability of a pest population, the developmental phases of the plants and their resistibility and upon the condition of the plantings. And they are dependent, for their part, upon the weather conditions, the biotic resistibility of the environment, the varietal characteristics of the plants and upon the agricultural practices employed. All of this is conditioned by the different damage levels for the insects, from a zonal standpoint and also within the borders of a zone.

The opinion persists that zonal peculiarities exert only a negligible influence on the level for the economic thresholds of damage caused by a majority of the harmful species of insects (V.I. Tanskiy, 1981). This is borne out by the fact that many of the thresholds that were developed turned out to be suitable for various zones. However, this testifies more to the inadequate validity of a number of approaches than it does to the non-feasibility of the zonal approach for developing them. Indeed, it is well known that the existing thresholds are extremely approximate. The level for the majority of them is so low that even a three-fold increase in them would not bring about a reduction in effectiveness when working with them (Z. Bosch and others, 1976). The imperfections in the existing methods for computing the number of pests are also deserving of attention. Indeed, the mistakes often reach 50 percent or more. The methods employed for determining them preclude the possibility of establishing the crop losses caused by pests with the required degree of accuracy. Obviously, with such methodological difficulties it is often impossible to uncover the true zonal differences in the thresholds. All of this serves to underscore the need for a more thorough approach in validating the thresholds and also for developing more improved methods for computing the numbers of pests and determining the crop losses caused by them.

It should be emphasized that theoretical prerequisites exist for the zonal differences in the thresholds, particularly the dependence of the harm caused by insects on the weather conditions and the developmental phases of plants. It is well known that the interaction between the development of a pest and a feed plant changes considerably by zones and this is necessarily reflected in the level for thresholds. For example, the grain leaf roller colonizes winter wheat sowings in the southern part of the Ukraine during the plant shooting phase and in France and Bulgaria -- during the tillering phase. The economic threshold for damage caused by caterpillars of this pest in the Ukraine is 50-100 specimens per m^2 (B.A. Areshnikov, S.P. Starostin, 1982; S.M. Vigera, 1982) and in France and Bulgaria -- 40-50 specimens per m^2 (Kh. Kontev, Zh. Shambon, 1975).

A similar dependence of the thresholds upon the character of the interaction in development of a pest and feed plant is observed in the case of other pests. All of this testifies to the need for zonal differentiation of thresholds.

Different degrees of harm caused by phytophages, both in various parts of their area of distribution and within the borders of a zone, are associated with the peculiarities of the weather conditions and this is also reflected in the threshold strength of the pests. Thus, during a cool and rainy spring the

economic threshold for damage caused by larvae of the grain leaf roller in the Ukraine equals 100 specimens per m^2 and during warm and dry weather -- 50 specimens per m^2.

The dependence of the thresholds for pest strength upon a broad complex of factors is borne out by many studies. It is especially well illustrated in the case of such a pest as the shield bug, for which a more intense differentiation of thresholds has been developed (B.A. Areshnikov, S.P. Starostin, 1982). Thus the threshold strength for overwintered bugs on well developed winter wheat sowings is 2 specimens per m^2 and on weak sowings and during years marked by early spring drought conditions -- 1-1.5 specimens per m^2. The strength threshold for larvae changes depending upon the developmental phases of the plants, the special purpose nature of the control work and the quality of the grain yield expected. In particular, during the period from the blossoming phase to the commencement of grain formation, the chemical treatments of the sowings should be carried out for the purpose of preventing quantitative losses in the crop from 10-15 larvae per m^2, during the phase of milky ripeness for maintaining the condition of strong and valuable wheat -- 1-2 specimens per m^2 and for the condition of ordinary grain -- 5-6 specimens per m^2.

A regularity in the variation of the thresholds, as a result of the mentioned factors, is borne out by materials obtained at UkrNIIZR not only for the shield bug and grain leaf roller but also for grain aphids, grain beetle and leaf beetle. Thus the threshold strength for the large grain aphid in the steppe zone of the Ukraine, during the period from the end of formation to the beginning of milky ripeness in winter wheat, on well developed sowings and especially during years marked by a moderate hydrothermal regime during May and June, is 25 specimens per stalk and if the plants are in a depressed state (associated with the cultivation conditions) -- the criteria are lower by a factor of 2-3 (M.G. Kostyukovskiy, 1979). According to data supplied by A.G. Govtvyanitsy, the strength threshold for the grain beetle during the phase from blossoming to the commencement of formation of the winter wheat grain was 3-4 specimens per m^2 and during the phase of milky ripeness -- 6-8 specimens per m^2.

The degree of damage inflicted and, it follows, the strength threshold for pests are dependent upon the varietal peculiarities of the plants. Thus the crop losses caused by grain beetles on sowings of the Bezostaya 1 winter wheat variety were lower by a factor of 5-6 than those sustained on sowings of shattering varieties of the Odesskaya 16 type.

The economic threshold for damage sustained also changes in connection with the cost of the insecticides used and also the procurement prices for the agricultural products. Meanwhile, up until recently proper importance was not being attached to these parameters. An expansion in the assortment of insecticides, which are still in short supply, leads to the use for combating pests of preparations which are close in terms of effectiveness but which differ in terms of price. Understandably, changes must take place in the thresholds depending upon the price of the preparation being used.

This applies in like manner to the purchase prices for field crop husbandry products. Over the past 5 years, these prices increased by almost 20 percent

for winter wheat grain and by twofold for a number of other crops. Meanwhile, existing threshold amounts are not being corrected with these factors being taken into account.

When developing differentiated thresholds, consideration must be given to the possibility of their practical realization. We assume that at any given time it is advisable first of all to take into account, in addition to the zonal peculiarities, the varietal structure of the plants and their developmental phases, the condition of the sowings, age structure of the pest, weather conditions, expected crop quality, special purpose nature of the control work, the cost of the crop under cultivation and the expenditures for carrying out protective measures.

An attempt should also be made to differentiate the thresholds by types and groups of related pests, since the degree of harm caused by individual types will vary. In the case of cereal grain crops, this applies to grain aphids, grain beetles and grain flies. For example, the degree of harm inflicted on winter wheat sowings by the large grain aphid is roughly higher by a factor of three than that caused by the common (Siphonaphis padi) aphid (B. Hinz and others, 1976; B. Freier, 1978). Naturally, the thresholds for these must be different.

At UkrNIIZR, based upon the principles mentioned, strength thresholds were developed for a number of the more dangerous cereal grain pests (mentioned earlier). Their extensive introduction into operations on farms in the steppe zone of the Ukraine testifies to the fact that they are making it possible to improve substantially the use of pesticides and, in particular, to lower the number of chemical treatments being carried out on plantings. Thus, during the 1972-1980 period, on farms in Bashtanskiy Rayon in Nikolayev Oblast, the insecticide treatment of winter wheat sowings against overwintered bugs was eliminated in all areas and treatments carried out against the larvae were decreased by 40-70 percent. In particular, of 32,500 hectares inspected during 1977, a treatment was required on only 15,100 hectares; of 14,100 hectares in 1978 -- 3,800; of 6,200 hectares in 1979 -- 3,000; of 4,000 hectares in 1980 -- 2,700 hectares.

In 1979 and 1980 at the Avangard Kolkhoz in Bashtanskiy Rayon in Nikolayev Oblast and also during the 1981-1984 period at the Kolkhoz imeni Krupskaya in Kakhovskiy Rayon in Kherson Oblast, as a result of work carried out on thresholds, the carrying out of special treatments on wheat sowings against grain aphids was eliminated on an area of approximately 1,000 hectares annually. In 1982-1984, on farms in Belgorod-Dnestrovskiy and Ovidiopolskiy rayons in Odessa Oblast, treatments against the grain leaf roller were eliminated in all areas.

According to data provided by V.I. Tanskiy (1981), the use of thresholds in the Soviet Union will make it possible to reduce the annual volume of pesticide use by an average of 30 percent, that is, on a minimum of 10-20 million hectares.

At the present time, in connection with the task for controlling the agro-ecological systems at a favorable phytosanitary level, a requirement exists for developing thresholds for a complex of harmful organisms. This is an extremely

complicated problem and the methods for solving it are not altogether clear. Obviously, the time is at hand for developing thresholds for individual types and, when summarizing the amount of harm they can inflict, for establishing the approximate thresholds for a complex of pests. Moreover, the indicators for harm caused by the more dangerous pests must be used as the basis here. For example, when grain aphids and wheat thrips inhabit wheat sowings simultaneously with the shield bug, the threshold for harm caused by the bug is used as the basis.

Let us assume that as improvements take place in the methods for diagnosing the physiological status of plants, that an optimum solution will be found for the task of developing all-round thresholds and that this will make it possible to determine the feasibility for exercising control over the degree of damage caused to plants. In the distant future, thresholds must be created not for the strength of harmful organisms but rather for the permissible thresholds of damage caused to plants by a complex of such pests.

A most important aspect of implementing improvements in chemical control is the possibility of employing thresholds in actual practice. As already mentioned, a serious obstacle with regard to accomplishing this at the present time is the absence of improved methods for computing the numbers of pests. These methods are usually laborious, extremely awkward and they preclude the possibility of carrying out inspections with the required degree of accuracy. It then becomes impossible to employ the economic thresholds for damage inflicted in a sound manner.

An urgent task is that of developing progressive methods for carrying out inspections. The possibility is being studied at the present time of using feromones for this purpose and fragments of remotely controlled accounting methods are being developed. It bears mentioning that the development of such methods, and others as well, must be carried out on a deep ecological basis. Unfortunately however, proper attention is not being given to this problem. It is our opinion that the time is at hand for creating special laboratories at the scientific institutes for plant protection for the development of and implementing improvements in the methods employed for inspecting plantings for their colonization by harmful organisms.

The efficient and intelligent use of thresholds also requires improvements in organizing the service for the observance and signalling of the appearance of harmful organisms. The solving of all of these problems -- is a rather complicated task and the work involves not only the development of economic thresholds but also their practical use.

7026
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NEW MOBILE PLANT PROTECTION LABORATORIES

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[Article by S. P. Starostin, V. M. Yefimov, deputy directors of the All-Union Institute for the Protection of Plants, I. D. Bukhtiyarov, director of SOPKTB SO [possibly; Agricultural Section of the Design-Construction Technical Buro, Siberian Department] of the All-Union Academy of Agricultural Sciences imeni V. I. Lenin and A. F. Zubkov, senior scientific worker at VIZR: "Learning To Operate PABL's"]

/Text/ The work of a field observer is a very difficult task. He must travel over dozens of kilometers daily carrying out mass inspections of plants to determine the degree of colonization by pests, infestion by diseases and contamination by weeds. He spends entire days in the field and the result is several dozen tests -- a laborious and tiresome process. Moreover, the plants and soil must be transported over a considerable distance to a laboratory for additional analysis. The work is dragged out and very little information is gathered. But what if the laboratory was moved closer to the field? Indeed, it is possible to create a mobile department which would have at its disposal the necessary instruments and equipment.

Five years ago, VIZR /All-Union Institute for the Protection of Plants/ commenced planning for a series of mobile agrobiocoenological laboratories (PABL's): PABL-1 -- for oblast plant protection stations, PABL-2 -- for rayon plant protection stations and PABL-3 -- for scientific research institutes and republic plant protection administrations.

The Agropribor NPO /scientific production association/ and TsNILP were tasked with producing the PABL-2. A laboratory mounted on an UAZ motor vehicle passed its first tests successfully (ZASHCHITA RASTENIY, No. 2, 1984). A PABL-1 was mounted on a KAVZ motor bus at the Agropribor NPO for oblast stations. This laboratory has been given considerable autonomy and will be used for carrying out route inspections over a period of many days. It contains optical, weighing and drying equipment, meteorological instruments, a power unit and miniature calculators. A ladder on the roof of the motor bus makes it possible to carry out observations of the crowns of fruit trees. Tests carried out in the Crimean Oblast have shown that the PABL-1 is more productive and can be used for inspecting orchards: a telescopic cross-arm installed on the roof makes it possible, at any height, to set various types of traps for insects and snares for the spores of phytopathogens.

VIZR, jointly with SOPKTB of the Siberian Department of VASKhNIL [All-Union Academy of Agricultural Sciences imeni V. I. Lenin], is completing work on an experimental PABL-13 agrobiocoenological laboratory that will be used for scientific studies carried out under expedition conditions and for all-round phytosanitary inspections. It will make it possible to expand considerably the gathering of scientific information. For measuring the parameters of the environment, a KRIS unit is being prepared which will make it possible to measure temperature and humidity automatically at 40 points simultaneously. A powerful compressor will ensure the semi-automatic gathering up of a number of insects and a unique mobile cross-arm with a television camera -- a television picture of plant cover and a determination as to the degree of weediness or infection of plantings by diseases. All of the information is accumulated and processed in an Elektronika-60 electronic computing complex. The laboratory's comfortable salon permits work to be carried out even under extreme conditions.

Work must still be carried out in connection with improving the experimental models of the mobile agrobiocoenological laboratories. Meanwhile, the personnel must learn how to operate the PABL's.

7026
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NEW EQUIPMENT FOR PLANT PROTECTION OPERATIONS

Moscow ZASHCHITA RASTENIY in Russian No 1, Jan 85 pp 39-41

/Article by M.I. Nezbritskiy, chief of GSKTB for Sel'khozkhimmash: "What the Equipment Designers Are Working On"/

/Text/ For this current decade, the Food Program has called for an increase of 12-15 percent in the return being realized from the use of chemical processes in agriculture. In solving this task, a great deal will depend upon the mechanization of applications of liquid fertilizers and pesticides.

Our country presently has approximately 250,000 sprayers. In recent years, an entire series of obsolete machines has been removed from production. This includes sprayers of the ON-400, OVT-1A and OVS-A.POU families.

In 1982 the L'vovsel'mash Plant commenced the series production of the OPSh-15 boom sprayer and the low-volume OUM-4 blower sprayer, in which new design-technological solutions are reflected. Thus the boom of the OPSh-15 machine has a swath width of 16.2 meters and it can be placed in its traveling or operating position by means of hydraulics operated from the tractor operator's working position. The boom consists of new mineral-ceramic diffusers with individual cut-offs; this makes it possible to apply a liquid within a range of 75-300 liters per hectare. On the OUM-4 blower sprayer, which replaced the ON-400-5 sprayer, disk rotating diffusers, a tank made out of glass-fiber-reinforced plastic, a blower wheel made out of aluminum alloys and the parts for a centrifugal pump made out of polymer materials were installed. The OUM-4 unit is intended for carrying out work in vineyards; it has a liquid expenditure norm of 100 liters per hectare, which is 5-10 times less than that used earlier.

As a replacement for the OVT-1V and OVS-A units, production has commenced on the low volume OPV-1200 sprayer, which was developed based upon use of the OPSh-15 serially produced machine and newly tested and well proven elements of blower sprayers. The POM-630 fertilizer sprayer and its beet modification POM-630-1 have been assigned to serial production.

Distinct from the POU, the POM-630 unit is equipped with a fermen type boom and has a swath width of 16.2 meters. With the aid of hydraulics, the boom is remotely controlled and moved into its traveling or working position from the tractor's cabin. The control panel is also hydraulically operated. The POM-630

and POM-630-1 units are being employed extensively in the cultivation of a number of crops, with use being made of the industrial technology (the same holds true for the PZhU-5 and PZhU-9 fertilizer sprayers with their plastic 3,200 and 6,400 liter tanks, which entered into production last year).

State testing has been carried out on a new generation of low volume sprayers: pull-type OP-2000, OP-2000-2, mounted type OM-630 and OM-630 and also the ultra-low-volume OM-320 and OM-320-2 sprayers.

A typical feature of the blower modifications for these sprayers is the fact that they are equipped with a unitized multiple-purpose working organs having a variable installation angle for the blowers and the rotating disk diffusers.

The multiple purpose working organ makes it possible, in a productive and high quality manner, to treat perennial plantings, orchards, vineyards and berry patches, with a broad range for regulating the expenditure norm for liquid (2-500 liters per hectare) and field crops (7-50 liters per hectare).

In the pull-type OP-2000-2 sprayer, use is made of a boom which has a swath width of 18-22.5 meters and mineral-ceramic diffusers with individual cut-offs. The track is regulated for a width of 1,500 and 1,800 millimeters. The machine has a high clearance (up to 500 millimeters). This sprayer can be used not only for providing pesticide treatments, but also for applying all-round liquid fertilizers, with a special set of diffusers being used for this purpose.

The OM-630-2 bomm sprayer is equipped with a boom having a swath width of 16.2 meters. The expenditure of liquid for field crops ranges from 75 to 300 liters per hectare. The tanks of the new sprayers are made out of stainless steel and they are equipped with external liquid filtering systems.

The OP-2000, OM-630 and OM-630-2 sprayers have been recommended for production based upon a decision handed down by the NTS /scientific and technical council/ for the USSR MSKh /Ministry of Agriculture/, Goskomsel'khoztekhnika and the Ministry of Tractor and Agricultural Machine Building. They will be serially produced during the 12th Five-Year Plan.

The ultra-low-volume sprayers -- OM-320 series family -- are deserving of special attention. Tests have been carried out on the blower (two-way and one-way) and boom modifications. The multiple purpose working organ used in the blower variants, discussed above, has been recommended for series production. The boom sprayer is equipped with rotating disk diffusers and has a hydraulic drive that is actuated by the hydraulic system of the tractor's power take-off.

A number of negative factors were revealed during state testing of the ultra-low-volume sprayers: lack of readiness on the part of workers attached to MIS's /machine testing stations/ and farms for working with such low expenditure norms for liquids, absence of the required grouping of pesticides, instruments, tools or a tractor with GSOM /gidravlicheskaya sistema otbora moshchnosti traktora; hydraulic system of a power take-off/, recommendations on the use of ultra-low-volume spraying were not issued. Obviously the development of this progressive trend in the mechanization of chemical protection for plants requires greater participation by specialists representing various profiles and better coordination of the efforts of interested departments and organizations.

Work is continuing on the development and testing of the mounted-type vegetable POM-630-2 fertilizer sprayer, the POM 1200 fertilizer sprayer for new powerful tractors of the 2 ton class (MTZ-142); PZhU-2.5-02 machines for applying liquid nematicides to the soil, MGUS-2.5 machines for thorough applications of ZhKU to orchards. Developmental work has been started on attachments for melon sowing machines for the white-washing of tree trunks and for local band placement of ZhKU.

We are also working on the development of a highly serviceable self-propelled machine with interchangeable technological units, for use in applying dry and liquid mineral and organic fertilizers. The highly serviceable ESVM-7 power unit and nine interchangeable technological units for use with it were developed using T-150 tractor units. The plans called for hydraulic control for the working units and a synchronous drive for the mechanisms in the interest of achieving uniformity in fertilizer applications. A low unit pressure on the soil will make it possible to work on water-logged soil even during the post-seedling period and the equipping of the machines with an optical system for accurate driving will eliminate mistakes and produce savings in the use of costly chemicals.

The machines underwent state testing in 1984 and an experimental group of them is now being prepared for extensive farm testing.

The improvements in the technical level of sprayers of the present and future generation are advancing raised requirements with regard to the personnel who operate them. Improvements in the service life and reliability of the machines are dependent upon technical servicing work being carried out on them in a correct and timely manner and on a monthly or periodic basis. The amount of servicing work is stipulated in the instructions. However, author's supervision over the operation of these machines, carried out in 1982-1983, revealed that a considerable portion of the machines is being used in violation of the rules. Deviations from the instructions are being tolerated, particularly in connection with the disassembling of the machines and their tuning and adjustment.

The system of machines for 1981-1985 and for the period up to 1990 defines the the types of machines and equipment required for the chemical disinfection of seed for all of the principal agricultural crops, with the trend towards converting over to centralized disinfection being taken into account. In addition to serially produced fixed disinfection units for seed plants, the plans call for the creation of complexes of equipment for the disinfection departments of rayon, inter-farm and farm points in various climatic zones throughout the country.

Machines and equipment will be created for the coating and disinfecting of seed for sugar beets, vegetable crops and cotton.

In all, the system includes 18 items of equipment for the mechanized treatment of seed. This includes the mobile PS-10, PSSh-5 and PS-30 (in place of the PS-10) disinfecting units; the fixed APKh-5, KPS-10, KPS-20, KPS-40, APS-4A and APZ-10 units; three flow lines for the coating of seed; a KTS-0.5 thermal-decontamination unit; disinfecting units for potato tubers (mobile and fixed). Of the above mentioned units, only four are being produced: APZ-10, APS-4A, PSSh-5 and PS-10.

Domestic lines for the coating of sugar beet seed have been installed at the Buryn and Lebedin seed plants. Work is being completed in the PO [Production Association] L'vovkhimsel'khozmash on the production of two more sets of seed coating equipment. The KPS-10 fixed disinfecting unit is undergoing state testing. The remaining works are in the stage of preliminary testing. We are working on the development of a disinfecting unit for coated sugar beet seed.

The work has slowed down owing to a lack of standard plans for disinfecting departments at seed plants and mechanized points. In buildings which have already been erected at seed plants of the Ministry of Procurements and especially Sortsemprom (and there are already more than 1,500 of them), it is difficult to ensure normal sanitary-hygienic working conditions. The disinfecting of runoff and waste water has not been organized at fixed disinfecting points.

Great importance is attached to converting over to the cultivation of sugar beets, vegetable crops and cotton based upon the use of coated disinfected seed. The coating of seed makes it possible to reduce the sowing norm by a factor of 3-5 and to lower labor expenditures in the cultivation of agricultural crops by a factor of 2-3.

Our design bureau, in collaboration with a number of organizations, has created an industrial technology and also machines and equipment for the production of seed coating material. Tests have been carried out on serially produced disinfecting units and newly created fixed sets of equipment for the disinfecting of wheat seed involving the use of film-forming polymer substances.

A serious problem continues to be that of mechanizing the preparation of working liquids and refuelling sprayers with them. The fixed SZS-10 refuelling station is being produced in large batches and yet this is still insufficient for satisfying the increasing requirements of agriculture. It is possible for this shortage to be compensated by the use of mobile units. But the series production of the APZh-12 unit, recommended for production 5 years ago, has still not been organized owing to a lack of production capabilities.

The GSKTB of sel'khozkhimmash is attempting to replace the APZh-12 through the use of various attachments for newly developed fertilizer distributors and sprayers. At a number of farms and associations of Sel'khozkhimiya, use is being made of the Hungarian Mobimiks-1 refuelling unit and the Bulgarian STK-5 unit.

Work has commenced at L'vovkhimsel'khozmash Production Association aimed at introducing into production tanks made out of glass-fiber-reinforced plastic (capacity of 1,200 and 2,000 liters) and also of polyethylene (capacity of 320 and 630 liters). Jointly with UNIIMESKh [Ukrainian Scientific Research Institute of Rural Mechanization and Electrification], an automatic system was developed for maintaining the expenditure norm for working liquid (ASURZh) for boom sprayers. Bench and preliminary tests have shown that this system ensures the maintenance of an assigned norm for issuing a preparation with a deviation of not more than $\pm$ 5 percent.

In the interest of raising the quality and shortening the periods for developing designs, an integrated system is being created for the very first time at GSKTB

for the automatic planning of machines used for applying fertilizers and for the chemical protection of plants. It will be based upon the use of modern electronic computing equipment and upon maximum standardization and unification of sets of parts, technological processes and planning methods.

Permit us to add a few words concerning small scale mechanization: in recent years the production of manual and knapsack equipment has increased throughout the country by 19 percent and now exceeds 2 million units annually. Such equipment is being produced by more than 30 plants. In carrying out the function of the leading design organization, GSKTB is performing work concerned with the creation of new types of small scale equipment and improving its technical level. In particular, the modernization of the serially produced ORR-1 Era sprayer has been carried out and the development of the OMT-0.3 sprayer for a miniature tractor of the .2 ton class. The unit is presently undergoing state testing.

Further improvements in and the development of mechanization for chemical treatments are being carried out along the following lines: improvements in the productivity of the machines by increasing the width of the swath, the operating speeds and the capacity of the tanks; lowering the norms for expenditure of the working liquids; equipping the sprayers with accurate diffusing, dosing and control equipment; lowering the material-intensiveness of the machines and raising their durability through the use of progressive materials; strict observance of the requirements for sanitary-hygienic working conditions and for protecting the environment.

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PLANT PROTECTION WORK OF ABKHAZ ASSR QUARANTINE INSPECTION SERVICE

Moscow ZASHCHITA RASTENIY in Russian No 1, Jan 85 pp 42-43

/Article by V.I. Gagua, chief of the Abkhaz Quarantine Inspection and A.I. Prokopenko, head of a laboratory: "In the Abkhaz Inspection"/

/Text/ With each passing year, greater quantities of imported goods, including plant products and consumer goods, are being brought into the Abkhaz ASSR from more than 40 countries. In order to prevent the penetration into our country of quarantine and alien pests, diseases and weeds, the specialists attached to the quarantine inspection are exercising thorough control over the products. Thus, in 1983 inspections were carried out on 7,234 specimens of seed for various crops, more than 25,000 tons of food goods, 12,600 tons of technical freight, 400 tons of fresh fruit, 2,000 tons of dry fruit, 5,200 tons of grain and so forth. More than 23,000 tons of quarantine materials were brought in from other regions of the country. Specimens which were suspected to be contaminated were delivered to a laboratory for expert analysis. Such analyses established the presence, for example, of dead cocoons of the American white butterfly on tobacco brought in from Rumania, live imagos of meal worms in bread wheat obtained from Bulgaria, pathogens of stalk scald in soybean specimens from the U.S.A. and the KNDR /Korean People's Democratic Republic/ and the seed of quarantine weeds -- great ragweed and common ragweed -- in soybean grain from the U.S.A. and Argentina. In freight transported within the country, pests were detected which have a very limited distribution in the USSR: citrus white fly, Japanese waxy soft scale, Comstock scale and potato moth. The contaminated products were fumigated. In 1983, workers attached to a fumigation detachment disinfected 874,000 units of planting stock, 441,000 onion bulbs, 200 tons of potatoes, 50 tons of pomegranates and other products and also packaging materials, warehouses, storehouses and museum facilities -- in all, more than 5,000 cubic meters.

Each year the rayon inspectors, jointly with laboratory specialists, inspect the agricultural lands and private plots for the purpose of ensuring timely detection of quarantine objects on the republic's territory. In each rayon there is an inspector who is responsible for issuing a report twice monthly on the work carried out and who also composes a bi-monthly plan. This raises the responsibility of the workers for their assigned tasks and in the final analysis it aids in delaying the spread of quarantine species.

In all, 17 quarantine objects have been recorded in the republic: cotton cushion scale, citrus mealy bug, Japanese waxy soft scale, Japanese stick-like

soft scale, Colorado potato beetle, potato moth, eastern fruit fly, mulberry scale, citrus white fly, California soft scale, Comstock scale, phylloxera, soybean stalk scald, great ragweed, common ragweed, Carolina nightshade and dodder.

Chemical treatments are carried out for the purpose of protecting tobacco, eggplant, tomatoes and other crops of the nightshade family from the potato moth. However, equal importance is attached to the use of agrotechnical and prophylactic measures. In the centers of infestation, following the harvesting of the crop, the fields must be thoroughly cleansed of the residues of nightshade family crops and weeds. Thereafter the soil is thoroughly plowed up. The residue of nightshade family crops and other litter obtained from storehouses and from the fields is burned and the facilities treated with 1 percent chlorophos.

The damage caused by a number of quarantine insects has been lowered considerably throughout the republic owing to the use of the biological method. Thus, over a period of many years, the predatory novius beetle has been holding down the numbers of the cotton-cushion scale. The spread of a pest of fruit crops -- mulberry scale -- has been suppressed by the parasite prospal'tella berleze. As a result of the colonization of more than 200,000 coccophagus gurnei on an area of 379 hectares, success was achieved in stabilizing the centers of infestation by the citrus mealy bug and in eliminating it on an area of more than 50 hectares. The skutellista parasite is playing a notable role in reducing the number of Japanese waxy soft scale, the predatory serangium beetle and ashersoniya fungus -- the citrus white fly, and Pseudaphycus malinus -- Comstock scale. Many of the entomophages have become acclimatized to conditions in the Abkhaz ASSR and thus there is no longer a need for their colonization.

The inspectors exercise year-round control over a quarantine nursery at the Sukhumi Experimental Station of VNIIR, where imported seed for perennial and annual crops are grown. In 1983 the nursery received almost 6,000 specimens of seed, of which amount approximately 3,000 specimens were released. All of the material was inspected thoroughly by laboratory specialists in the interest of preventing contamination. In addition, the fields were treated four times during the growing season.

As a result of vigilance on the part of the inspectors and specialists attached to the quarantine laboratory, not one quarantine species has been recorded since the quarantine nursery was established (1957) and the nursery issues only healthy planting stock.

The workers attached to our inspection are monitoring in a strict manner the quarantine rules when transporting freight and also when carrying out measures on the farms and private plots. In 1983, fines were imposed upon 73 individuals for having violated the quarantine rules and warnings were issued to many others.

The inspectors are receiving a considerable amount of assistance from the quarantine laboratory, which has a staff of 10 individuals. For the most part these are persons who have worked here for more than 20 years. Each year the

specialists examine approximately 10,000 specimens. However, their work is not limited to making a determination as regards pests, diseases and weeds or to organizing inspections, but rather it also includes creating new methods for combating quarantine and especially dangerous objects, in collaboration with scientists attached to GISKh /Gruzinskiy institut sel'skogo khozyaystva; Georgian Institute of Agriculture/ and VNPOChiSK /Vsesoyuznoye nauchno-proizvodstvennoye ob"yedineneniye chaya i subtropicheskikh kul'tur; All-Union Scientific Production Association for Tea and Subtropical Crops/. Thus, a number of herbicides were tested under production conditions. The herbicide Roundup proved its worth in the campanig against quarantine and harmful weeds. As a result of its use, a center of infestation by great ragweed at the Kioraz Kolkhoz (Gagrskiy Rayon) was eliminated and many other centers localized.

Jointly with specialists of VNITIKiZR, schedules were established for the storage and transporting of vegetables following fumigation, new pesticides are being analyzed and a study has been undertaken on the biology and ecology of the potato moth.

The experience that has been accumulated and the knowledge possessed by the workers are being transferred over to the young specialists.

The following individuals have proven themselves to be fine tutors: entomologist S.G. Machavariani, phytopathologist L.A. Stolyarova, specialist in use of the biological method L.A. Mokrousova, for weeds -- N.A. Todua, toxicologist M.G. Katsitadze, senior laboratory worker G.S. Gvazava, and also senior agronomist-inspectors at the Sukhumi border point T.K. Chikovani and A.V. Badzagua, senior agronomist for the inspection Z.S. Dzhikiya and inspectors for Sukhumskiy, Gulripshskiy and Gudautskiy rayons T.V. Chaligava, G.A. Chochiya and A.T. Vartagava.

The inspection is receiving a great amount of assistance from public representatives, of which we have 494. Many of them have been working with us for 15-20 years. A number of other individuals are deserving of mention: the deputy chief of the production laboratory at the Sukhumi Milling Plant M. Sadzhaya, the head of a warehouse at a tobacco farm G. Gunia, an expediter for Torgmortrans G. Kvaratskheliya, the head of a quarantine nursery R. Oksuzyan, the senior agronomist-entomologist at the Sukhumi Experimental Station for Sub-tropical crops M. Gaprindashvili and an agronomist-entomologist at a Chernomorsk sovkhoz for decorative gardening V. Ugulava.

The specialists of the inspection and laboratory are publicizing their plant quarantine knowledge during seminars, during discussions held with the population, students and seasonal workers and also over the radio and in the press. In 1983, 230 lectures, consultations and discussions were conducted. Twenty articles were published in journals and republic newspapers and six speeches were broadcast over the radio.

In 1984, socialist obligations were undertaken aimed at improving the phytosanitary situation throughout the republic. The inspection's workers honorably fulfilled their stated plans and invited the Adzhar ASSR inspection to join in a competition with them.

This year the workers attached to the quarantine service must intensify their control over the inspections, establish the dimensions for the centers of potato moth infestation and undertake all of the measures required for eliminating the.

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AUTOMATIC SYSTEM FOR COMBATING POTATO BLIGHT

Moscow ZASHCHITA RASTENIY in Russian No 1, Jan 85 p 46

/Article by A.V. Filippov, head of a laboratory at the All-Russian Scientific Institute of Phytopathology; B.I. Gurevich, senior scientific worker; S.A. Panin, senior engineer; I.V. Gayvoronskaya, head of the Russian Republic Laboratory for Forecasts and Diagnostics; L.U. Bondar', engineer at KVTs; A.V. Stas', head of a department: "The ASS and Protection of Potatoes Against Late Blight"/

/Text/ Effectiveness in the use of fungicides against potato blight is dependent to a considerable degree upon their being used in a timely manner. VNIIF /All Russian Scientific Institute of Phytopathology], jointly with a computer center of Rossel'khozkhimiya, has developed an automatic system of signalization (ASS) for indicating the periods for treating potatoes, with use being made of a forecast on the development of the disease. The creation of this system was based upon the premise that each treatment of a planting (the first and subsequent ones) must precede reinfection of the plants; the weather which favors the development of potato blight is as a rule conditioned by circulatory processes which encompass a large territory simultaneously. Thus the centralized issuing of signals is possible. Signals transmitted from a central point must be advisory in nature; decisions concerning treatments are made at the sites taking into account the available potential.

An algorithm is prepared based upon the ASS: $Y = -1.788 - 0.216T_1^{max} - 0.191T_2^{max} - 0.119T_3^{max} + 0.004T_1^{min} - 0.171T_2^{min} + 0.628T_3^{min} - 0.479\ O_1 + 0.513\ O_2 + 0.046\ O_3 + 5.947\ F_1 + 6.699\ F_2 + 4.328\ F_3$, where Y represents the possibility of reinfection of the plants, T_1^{max}, T_2^{max}, T_3^{max} -- maximum air temperature, T_1, T_2^{min}, T_3^{min} -- minimal air temperature ($^{\circ}C$); O_1, O_2, O_3 -- cloud cover in points; F_1, F_2, F_3 -- probability of precipitation (1 -- precipitation is expected, 0 -- precipitation not expected). The indicator points out which of the three successive days is indicated by a particular element of a forecast.

It is apparent from the algorithm that a computation of the conditions favorable for reinfection of plants is carried out in accordance with the elements of a 3-day weather forecast.

If Y is greater than 0, then the weather conditions promote reinfection of the plants and the potatoes should be treated with a fungicide. If Y is less than

0, then the conditions for the development of potato blight are unfavorable and spraying is not required.

In 1982 and 1983, experimental-production operation of the system was carried out in the RSFSR. In 1982, 15 subscribers were served and in 1983 -- 24: Mari, Mordovian, Chuvash, Tatar and Udmurt autonomous republics; Vladimir, Ivanovo, Kaluga, Kostroma, Moscow, Orel, Ryazan, Smolensk, Tula, Yaroslavl, Gorkiy, Kirov, Kursk, Lipetsk, Tambov, Penza, Novosibirsk and Omsk oblasts and the Maritime Kray. Eight territorial administrations of Goskomgidromet were drawn into this work in the interest of ensuring operation of the ASS.

Each day, from 1200 to 1300 hours, these administrations transmitted a 3-day weather forecast by teletype to the KVTs /coordinating computation center/ of Rossel'khozkhimiya. The meteorological information obtained was entered into an EVM /electronic computer/ and by 1600 hours the results of the computation were being transmitted to an administrative group for analysis. At a plant protection station, the decision handed down was received by teletype in the form of a signal: "Spray the potatoes against potato blight." After receiving such a signal, the station's workers use the oblast's radio network for transmitting a warning to the farms: "Favorable conditions are expected for the development of potato blight. It is recommended that a fungicide treatment be given to those fields of susceptible potato varieties which have achieved the budding stage and which have not been treated within the past 10 days." If the conditions favorable for the development of the disease continue for several days, the signals regarding treatments are transmitted daily, but they apply to unprotected fields.

For the purpose of evaluating the effectiveness of the ASS, 5-6 control farms were singled out in a majority of the oblasts and ASSR's. On these farms, treatments carried out on the basis of signals were compared against sprayings conducted in accordance with on-going programs in the various areas.

In 1983 the overall area of potato plantings serviced by the ASS was roughly 1 million hectares. The duration of the daily cycle for computing the spraying requirements for the 24 oblasts was 3 hours and this made it possible to deliver the signals to the plant protection stations by the end of the current day.

In 1982 the number and schedules for transmitting signal reports conformed for the most part to the actual degree of development of the disease in the oblasts serviced. Thus, in the Tatar ASSR, the Maritime Kray and in Omsk and Novosibirsk oblasts, where no danger was posed by potato blight, the signals for spraying were either not issued at all or issued only once. This made it possible to reduce the repetitions in the use of fungicides. In oblasts where there was a higher level of development of the disease, signals were transmitted which called for two and three treatments during periods considered to be most vulnerable for the pathogen. An increase took place in the number of treatments administered in the Mari ASSR. The average increase in yield obtained as a result of use of the ASS amounted to approximately 17 percent.

In 1983, on the territory of a majority of the oblasts serviced, conditions developed which were favorable for the appearance of potato blight. The number

of signals transmitted, similar to 1982, conformed to the level of development of the disease. According to data furnished by plant protection stations, the potato yields obtained from fields treated on the basis of signals were on the average 22 percent higher than those from fields on which the plants were sprayed in accordance with a program.

The experimental-production operation of the ASS revealed that more efficient operation of the system was hindered by the fact that some farms lacked the equipment needed for carrying out the protective measures within the recommended periods, coordination was not arranged between a fixed spraying plan and signals from the automatic system, in a number of instances the signals were not made available to the farms on a timely basis owing to the absence of a reliable link on the line KVTs - plant protection stations - farms; the ASS operates only on the working days of the week. Notwithstanding the mentioned difficulties, the ASS proved to be of assistance in implementing protective measures in a majority of the oblasts serviced and during the best periods.

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CHARACTERISTICS OF KAFPON, AMIDIM HERBICIDES

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/Article by A.M. Davydov, head of a department at VNITIG; A.A. Petunova, senior scientific worker at the All-Russian Scientific Research Institute for the Protection of Plants; G.V. Mikhaylova, junior scientific worker at VNITIG/

/Text/ Amidim. This is a new domestic herbicide that is based upon use of the salts of 2,4-dichlorphenoxyacetic and polychlorobenzoic acids. It is of medium toxicity for warm blooded animals: LD_{50} for rats, 724 milligrams per kilogram. The preparation form -- 50 percent water solution of a dark brown color with a specific odor of amine.

It has been recommended for experimental-production use on winter wheat. The sowings are sprayed in the spring during the tillering phase. The expenditure norm is 1.4-2.4 liters per hectare. This herbicide destroys dicotyledonous weeds, including those resistant to 2.4-D: scentless mayweed, chickweed, species of bedstraw, drug fumitory, knotgrass, black bindweed, hemp nettle, cornbind and others. In terms of its spectrum of action and activity, amidim is not inferior to dialen and it surpasses amine salt 2,4-D. This preparation appears to be most promising for use in the Baltic region and the nonchernozem zone of the RSFSR, where in recent years an increase has taken place in the number of species resistant to 2,4-D, with their proportion exceeding 50 percent.

During state testing carried out in the nonchernozem zone, amidim in a dosage of 1.4 liters per hectare destroyed 75 percent of the weeds and a dosage of 2.4 liters per hectare -- 100 percent, whereas amine salt 2,4-D destroyed only 53 percent. Such a difference in effectiveness is explained by the destruction in the amidim variants of scentless mayweed and field violets. In Lithuania, the use of this herbicide in a dosage of 1.4 liters per hectare destroyed knotgrass, black bindweed and scentless mayweed by 100 percent, hemp nettle -- by 92 percent and rugged knotweed -- by 73 percent.

If the regulation with regard to a residue of this preparation in grain is observed, the crops in a crop rotation plan will not be adversely affected. In the case of an over-dosage of the preparation, losses may be sustained in pulse and beet crops the following year.

Amidim appears to be a promising herbicide for controlling weeds in plantings of short-stalk varieties of winter rye, for example Chulpan and also corn.

Owing to insufficient selectivity, this herbicide should never be used for spring wheat, oats or barley in the absence of a study being carried out on varietal sensitivity.

Kafpon. This domestic, selective and composite herbicide contains a mixture of salts of phenoxyacetic and chlorobenzoic acids. It is of medium toxicity for warm blooded animals: LD_{50} for rats, approximately 800 milligrams per kilogram taken orally.

Preparation form -- 50 percent water solution of a dark brown color with a specific odor of amine.

It is recommended for experimental-production use on spring wheat sowings. It appears to be a promising herbicide for use on winter grain crops. It destroys dicotyledonous weeds which are resistant to 2.4-D and 2M-4X: goosegrass, common hemp nettle, drug fumitory, black bindweed, scentless mayweed and field violets and also which are sensitive to them -- shepherd's purse, wild radish, lamb's quarters and others. It suppresses perennial plants very well: creeping thistle, field sowthistle and spurge.

Sowings are sprayed during the tillering phase. The expenditure norm is 2-3 liters of the preparation per hectare. When the herbicide is used in the recommended dosages, there is no residue in the grain and no adverse consequences are noted in the crops of a crop rotation plan.

In terms of activity, kafpon surpasses diamet in comparable dosages and in terms of the spectrum of weeds destroyed -- amine salts 2,4-D and 2M-4X. The optimum conditions and methods for employing kafpon are the same as for amine salt 2,4-D.

The results of studies carried out at VNITIG and VIZR /All-Union Scientific Research Institute for the Protection of Plants/ proved the advantage possessed by kafpon over amine salt 2,4-D in Kazakhstan, the Bashkir ASSR and in other areas where the grain crops are contaminated mainly by scentless mayweed, species of bedstraw, hemp straw, jointweed and other dicotyledonous weeds which are resistant to 2,4-D.

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CHARACTERISTICS OF PESTICIDES FOR ORCHARDS AND GARDENS

Moscow ZASHCHITA RASTENIY in Russian No 1, Jan 85 pp 57-59

/Article: "Pesticides for Private Orchards and Gardens"/

/Text/ In this and future issues of the journal, in response to requests from readers, detailed information will be provided on preparations included in the "List of Chemical and Biological Agents for Combating Pests, Diseases and Weeds Authorized for Retail Sale to the Population in 1984-1987."

Insecticides, acaricides, molluskocides (preparations for combating harmful insects, plant mites and slugs)

Benzophosphate. A white crystalline substance with a garlic odor. Produced in the form of 10 percent k.e. /emulsion concentrate/ and 10 percent s.p. /wetting powder/.

A contact action insecticide which also displays acaricide activity. It is used extensively as a substitute for chlororganic preparations. Both forms are recommended for spraying during the growing season for potatoes, eggplant and tomatoes for combating the Colorado potato beetle and potato moth, apples and pears -- against the fruit moth, leaf roller, diamond moth, aphids, mites and other leaf-chewing and suctorial pests; plums, cherries, peaches, apricots and mazzard cherries and also grapevines -- against the leaf roller, checkered beetle, aphids, mites and other dangerous objects; citrus crops -- against the white fly, mites, scale insects; common hops -- against the hops aphid; common tobacco and rustic tobacco -- against the boll worm, aphids and thrips. The expenditure norm for benzophosphate for all of the crops mentioned -- 60 grams per 10 liters of water.

The preparation remains active during comparatively low air temperatures -- plus 10-12°.

Benzophosphate disintegrates rather rapidly in the soil, on leaves and inside plants. Its protective action continues for 15-20 days and in some cases up to 30 days.

The last treatment for potatoes, eggplant and tomatoes must be carried out no later than 30 days prior to harvesting the crop; common hops -- 20; apples, pears, plums, cherries, mazzard cherries, peaches and apricots -- 40; grapevines and citrus crops -- 60 days.

The leaves of tobacco plants can be crushed no earlier than 10 days following treatment with the preparation.

The maximum number of treatments during the entire growing season -- not more than two.

The preparation is considered to be a highly toxic compound and it penetrates skin only weakly, causing local irritation. Benzophosphate is not considered too dangerous for bees.

It should be stored in closed plant packaging material.

Diazinon (bazudin). It is produced in the form of 5 percent gran (granules) and it is yellowish-grey in color.

This contact-intestinal insecticide has a broad spectrum of action. It is recommended for combating click beetles in corn sowings and the grain beetle in winter wheat. In such cases, the diazinon granules are applied (40 grams per 10 m^2) to the soil simultaneously with the seed. Against click beetles in potato sowings, it is applied (30 grams per 10 m^2) to the soil during planting. It is also employed against the cabbage maggot in cabbage plantings by distributing the granules over the soil's surface (20 grams per 10 m^2). No more than 1 diazinon treatment is authorized during a season. In the case of cabbage, it is carried out no later than 30 days prior to harvesting the crop and for the remaining crops -- during planting.

The adverse effect of diazinon on plants is eliminated when the recommended norms are used. If treatment involving the use of this preparation is carried out over a period of many years, certain insect pests develop an immunity to it.

Diazinon is highly toxic for warm-blooded animals and thus all precautionary measures must be observed in a strict manner. It accumulates only weakly in an organism. It can be stored in plant packaging materials for up to 2 years.

Dibrom. It is produced in the form of 10 percent k.e.

This insecticide has contact, intestinal and fumigational action. It is effective for combating the Colorado potato beetle on plotato plantings using a norm of 70-140 grams per 10 liters of water. Not more than 4 treatments are allowed per season, with the last being applied no later than 20 days prior to harvesting the crop.

Dibrom is classified as a medium toxic compound.

It is dangerous for bees and other useful insects.

Dibrom must be stored only in plant packaging materials.

Dilor. Produced in the form of 80 percent s.p.

This preparation has contact-intestinal action. It is used against the larvae and overwintered adult specimens of the Colorado potato beetle in potato plantings using a norm of 3-6 grams per 10 liters of water. The last treatment

should be applied 20 days prior to harvesting the crop. No more than three sprayings are authorized during the growing season. The protective action of the preparation continues for 12-15 days.

When the recommended norms are used, dilor is not phytotoxic and does not adversely affect plants.

It is only slightly toxic for warm blooded animals and poisonous for bees.

The preparation can be stored for practically an unlimited period of time in plant packaging.

Potash soap. This preparation contains mixtures of potassium salts of olein and other fatty acids and also not less than 40 percent fatty acids, not more than 25 percent non-saponifiable fat and up to 0.1 percent free alkali. It appears as a dense grease-like light-brown or greenish mass which dissolves well in water.

The preparation possesses contact action. It is used for spraying (in a norm of 200-400 grams per 10 liters of water) pip and stone fruit crops and also berry patches and grapevines, against suctorial pests during the growing season.

The last treatment should be applied 5 days prior to harvesting the crop. No more than 3 treatments are authorized per season.

All precautionary measures must be observed in a very strict manner, since the preparation irritates the skin and the mucous membranes of the respiratory tract and if it enters the stomach it causes vomiting.

It can be stored for an unlimited period of time in plant packaging materials.

Carbophos. Produced in the form of 10 percent k.e. and 10 percent s.p.

It is an insecticide and acaricide of contact action. It is used during the growing season on a broad range of agricultural crops against suctorial and leaf-chewing pests. For apples and pears, it is used against weevils, mites, aphids, fruit moth, leaf roller, pear and apple psylla, sawflies and scale insects (75-90 grams per 10 liters of water); for plums, mazzard cherries and regular cherries -- against weevils, cherry fruit fly, sawflies, aphids and fruit fly; for currants and gooseberries -- against leaf and shoot gall midges, aphids, sawflies, currant moth, leaf roller, scale insects, soft scales, snout moths, measuring worm moths (75 grams); for apricots, peaches -- against aphids and other pests (60 grams); for raspberries -- against raspberry-strawberry weevils, raspberry beetle, mites, raspberry bud moth and aphids; for strawberries -- against the white fly, mites, raspberry-strawberry weevil and sawflies (75 grams); for grapevines -- against mites and mealy bugs (75-90 grams); for citrus crops -- against mites, white flies, scale insects and other pests; for tea -- against the tea moth and aphids (90 grams); for cabbage -- against spring snowflakes, cabbage moth, flies, aphids and bugs; for cucumbers (outdoors and upon glass covered ground) -- against mites, Chortophila florilega, aphids, thrips and white flies; for tomatoes (outdoors and on glass covered ground) -- against white flies, mites and aphids; for table and sugar

beets -- against the miner fly, moths, aphids, bugs and cicadas; for watermelons and other melons -- against the melon fly, mites and melon lady beetles (60 grams); for peas -- against lima bean pod borer, pea moth and aphids; for corn -- against aphids, leaf cicadas and other pests; for grain crops -- against aphids and thrips (75 grams); for sunflowers -- against aphids and bugs; for mustard and rape -- against bugs, leaf beetles, cabbage moth, rape sawfly and beetles of the Nitidulidae or Curculionidae families; for common hops -- against leaf chewing caterpillars, sawflies, mites, hops aphid; for soybeans, peanuts and sesame -- against mites, cutworms, beet webworm and other pests (75 grams); for citrus crops -- against mites, white flies, scale insects and other pests; for tea -- against the tea moth and aphids (90 grams); for tobacco and rustic tobacco -- against bugs, aphids and thrips (100 grams).

The period for applying the last treatment to apples, pears, plums, regular cherries, mazzard cherries, currants, gooseberries, apricots, peaches, cabbage, cucumbers, tomatoes, beets, tobacco and rustic tobacco -- 30 days prior to harvesting the crop; grapevines -- 45; citrus fruit and tea -- 50; watermelon, regular melons, grain crops, corn, peas, sunflowers, mustard, rape, common hops, soybeans, peanuts and sesame -- 20 days.

Raspberries and strawberries should be treated only prior to blossoming and after the crop has been harvested.

Two sprayings are authorized for all crops, with the exception of table and sugar beets, for which three treatments are permitted during the season.

Carbophos is considered to be a compound of medium toxicity. It is extremely poisonous for bees. When the regulations are observed, it does not have any adverse effect on the plants protected. The systematic use of carbophos results in the appearance of insect and mite populations which are immune to it and thus carbophos should be alternated with other pesticides.

The preparation must be stored in closed plant packaging materials.

Kel'tan. Produced in the form of 20 percent k.e.

This is an acaricide of contact action. It is recommended for spraying plants during the growing season against spider mites. For cucumbers, tomatoes, pepper and eggplant outdoors or on glass covered ground and also for regular melons, watermelons, apples, pears, plums, regular cherries, mazzard cherries, currants, gooseberries, strawberries, common hops and raspberries, the expenditure norm is 20 grams per 10 liters of water; for grapevines and citrus crops -- 40 grams. Treatments are authorized for strawberries and raspberries only prior to blossoming or after the crop has been harvested. The period for the last treatment for currants and gooseberries is 30 days prior to harvesting the crop and for the remaining crops 20 days (an exception is the spraying of plants on glass covered ground; here the waiting period is 4 days). No more than two treatments per season are authorized.

Kel'tan possesses an extended protective effect. For example, in a fruit orchard its effect lasts for up to 40 days. The best result is achieved when there is direct contact between the preparation and a pest and thus the spraying of plants with kel'tan should be carried out in a very thorough manner.

This preparation is of medium toxicity with regard to warm blooded animals and it penetrates skin very easily. Thus, upon striking the skin the preparation should be removed immediately and thereafter the skin should be washed using water and soap. Concentrated water solutions may irritate the mucous membranes.

For all practical purposes, kel'tan causes no harm to bees.

Mezox. A contact intestinal insecticide. It is produced in the form of 25 percent k.e. -- an oily cream-colored liquid with the odor of a solvent. The preparation decomposes rapidly and does not accumulate in objects in the surrounding environment.

It is recommended for use in spraying potatoes against the Colorado potato beetle in a norm of 60 grams per 10 liters of water. The last treatment should be carried out no later than 20 days prior to harvesting the crop. The maximum number of treatments during a season -- two. It is of low toxicity as far as warm blooded animals are concerned and it is dangerous for bees and useful insects. It can be stored in plant packaging materials for practically an unlimited amount of time.

Metaldehyde. Produced in the form of 5 percent granules.

It is a molluskocide of contact and intestinal action. It is intended for combating slugs on regular tobacco, rustic tobacco, vegetable, fruit, citrus, berry and floral crops and also on grapevines in a norm of 30-40 grams per 10 m^2. The best effect is achieved when it is used during dry and warm weather, in the evening or early morning. It is not recommended that treatments be carried out following rainfall. The granules of the preparation are placed in inter-row spacings, on tracks or on the soil's surface, under plants and shelters and in areas where the slugs live and reproduce. Upon coming into contact with metaldehyde, the slugs release a large amount of slime and, as a result, they dry up and die within a matter of 2-3 days.

Metaldehyde can be used no later than 20 days prior to harvesting the crop and the frequency of treatments -- not more than twice during a season. The duration of the preparation's effect -- 20 days.

Plants will not be adversely affected by metaldehyde if the recommended norms for using it are followed. It is of medium toxicity for warm blooded animals and it is of weak toxicity if it penetrates the skin. It does not have an irritating effect on skin. If the preparation enters one's eye's, it should be washed out with a large quantity of water.

It should be stored in factory packaging materials.

Preparations Nos. 30, 30A, 30C, 30CC and 30M. They are produced in the form of a 76 percent mineral oil emulsion, which is white-grey in color and which is well mixed with water.

These are contact preparations: they destroy a pest upon striking its body. Oily emulsions spread very well and thus the insects are covered by a thin film of the preparation. This causes a disruption in the gas exchange and

water regime. In addition, the pesticide penetrates the bodies of the pests and poisons them.

Preparations Nos. 30, 30a, 30c, 30cc and 30m are recommended for spraying plants during the early spring, prior to the commencement of opening of the buds and when the air temperature is not lower than +4°. For apples, pears, cherries and plums, they are employed against scale insects, mites, leaf rollers, aphids, psylla and moths; for citrus crops (in the early spring during the phase of relative dormancy) -- against scale insects, soft scales, citrus white fly, citrus silver mite (in a norm of 300-400 grams per 10 liters of water); for decorative trees and bushes -- against the wintering stages of scale insects, aphids, mites and others; for grapevines -- against wintering stages of aphids, mites and scale insects (400 grams); for gooseberries, currants and raspberries -- against wintering stages of aphids, mites, scale insects, soft scales, leaf rollers and others (300 grams).

The spraying must be abundant in order to ensure that the liquid drenches the branches thoroughly on all sides and penetrates into the cracks of the bark.

Only one early spring treatment per season is permitted.

In addition, it is recommended that apple, pear and decorative trees be sprayed during the summer at the beginning of the appearance of zoospores of the 1st-2d generation of scale insects (200-500 grams per 10 liters of water). No more than 2 treatments are authorized, with the last one being carried out not later than 7 days prior to harvesting the crop.

Oily emulsions are only slightly toxic and yet when there are great concentrations of vapors in the atmosphere they can cause poisoning and they can also cause irritation upon contacting the skin or mucous membranes. Thus the required precautionary measures must be observed when working with these preparations.

They can be stored for practically an unlimited period of time in factory packaging materials.

Rovikurt. Produced in the form of 25 percent k.e., 10 percent k.e., 5 percent k.e., 10 percent s.p., 5 percent s.p. This insecticide of intestinal-contact action is intended for use in combating various agricultural crop pests.

All of the preparation forms of rovikurt are recommended for spraying during the growing season for combating suctorial and leaf chewing pests. On potato plantings, it is used against the Colorado potato beetle; for cherries -- against the cherry fruit fly; for apples -- against the apple fruit fly, brown tail moth, green apple aphid, moth and leaf rollers; for cucumbers and tomatoes on glass covered ground -- against aphids and the white fly; for cabbage -- against cutworms, moths and the spring snowflake; for grapevines -- against the leaf roller; for currants -- against leaf rollers, moths, aphids and other pests; for currants -- against the currant fly. The norm for the expenditure of 25 percent k.e. -- 10 grams per 10 liters of water on all of the recommended crops, 10 percent k.e. and 10 percent s.p. -- 25 grams, 5 percent k.e. and 5 percent s.p. -- 50 grams.

The period for the last treatment for all of the preparation forms, for potatoes -- 15 days prior to harvesting the crop; for cherries, apples, cabbage, currants and gooseberries -- 20; for grapevines -- 25; for cucumbers and tomatoes on glass covered ground -- 3 days. Potatoes can be treated during the growing season; apples, cabbage, grapevines, currants and gooseberries -- not more than twice; cherries -- once; cucumbers and tomatoes on glass covered ground -- four times.

Rovikurt is only slightly toxic for warm blooded animals.

Trichlormetaphos-3 (triphos). Produced in the form of 10 percent k.e.

It is a contact insecticide. It is recommended for spraying plants during the growing season against suctorial and leaf chewing pests: for apples and pears against leaf rollers, moths, sawflies, bugs, weevils, aphids, scale insects and mites; for currants and gooseberries against leaf rollers, sawflies, moths, aphids and mites (spraying of gooseberries and currants is permitted up until the commencement of blossoming and after the crop has been harvested); for cabbage against cutworms and moths, aphids; for cucumbers and tomatoes against aphids and thrips (after seedlings have been planted); for grapevines against mealy bugs and spider mites; for citrus crops against the red citrus mite, citrus white fly and mealy bugs; for tea against aphids and motile soft scale.

The expenditure norm for citrus fruit and tea -- 100-150 grams per 10 liters of water and for the remaining crops -- 50-100 grams.

It is of medium toxicity for warm blooded animals.

The preparation is toxic for bees. Use of the recommended norms does not bring about scald in a majority of the agricultural crops. However, an early spring spraying may result in a negligible amount of scald appearing on apples, pears and cherries. The duration of the protective action of the preparation is 12-15 days. The period for the last treatment is 30 days prior to harvesting the crop for all of the recommended crops, with the exception of gooseberries and currants, which can be sprayed only prior to the commencement of blossoming and following harvesting of the crop. In the case of currants, gooseberries and grapevines, trichlormetaphos can be used once during the growing season and for the remaining crops -- twice.

Trichlormetaphos-3 must be stored in factory packaging materials. In the absence of moisture, it can be stored for an indefinite amount of time.

Trichlorol'-5 and trichlorol'-5M. These are emulsifying concentrates of a summer type oil, with an additive of trichlormetaphos-3 (5 percent) and emulsifiers.

It is an insecticide of contact action. It is recommended for combating a complex of pests (mites, leaf rollers, scale insects, soft scales, psylla and others) on apples, pears, plums, quince, cherry-plums, apricots, peaches, regular cherries and mazzard cherries, during the period from the commencement of opening of the buds to the appearance of the flowers. The expenditure norm -- 200-300 grams per 10 liters of water. Only one spraying is authorized per

season. The effectiveness of the preparation (especially against the California scale insects) decreases when treatments are carried out either earlier or later.

If the preparations are stored for an extended period of time in cold facilities, then the working solution should be mixed well prior to preparation. The working solution must be prepared directly prior to spraying. A high degree of effectiveness in the use of trichlorol'-5 and trichlorol'-5M is achieved when they are employed during warm weather and when the pests are emerging from their wintering stage.

If the recommended expenditure norms are used, the preparation will not cause any damage to plants that are treated.

Trichlorol'-5 and trichlorol'-5M are of medium toxicity for warm blooded animals.

Foxim. Produced in the form of 5 percent k.e. and 5 percent s.p. and also 5 percent granules.

This insecticide has a broad spectrum of action.

Foxim, 5 percent k.e. and s.p., is recommended for spraying during the growing season for potatoes, tomatoes and eggplant against the Colorado potato beetle; for cabbage against spring snowflake caterpillars, cutworms and the cabbage moth. The expenditure norm is 100-150 grams per 10 liters of water.

The preparation decomposes rapidly. The duration of the protective action is up to 5 days. The period for the last treatment for cabbage is 30 days prior to harvesting the crop and for the remaining crops -- 20 days. A maximum of 2 sprayings is permitted for cabbage and for the other crops -- three.

Foxim 5 percent granules is intended for use in combating the grain beetle in winter wheat and click beetles in corn. It is applied once to the soil, together with the seed during sowing (50 grams per 10 m^2).

If the mentioned expenditure norms are not exceeded, the preparation will have no adverse effect on the plants. It is of medium toxicity for warm blooded animals. It possesses an expressed toxicity upon encountering skin.

It is dangerous for bees and other useful insects.

Chlorophos. Produced in the form of 80 percent s.p. Neutral or recrystallized cholorophos serves as the basis for the active substance.

This insecticide has a broad spectrum of action. It is recommended for spraying potatoes against the Colorado potato beetle, the potato lady bug and moths; for apples and pears -- against the fruit fly, leaf roller, weevils, moths, bugs, sawflies, apple tree borer and wood moth (20-30 grams per 10 liters of water); for plums and regular cherries -- against weevils, leaf rollers, sawflies, cherry moth, fruit moth and chalcid wasps; for grapevines -- against leaf rollers and zygaenidae (15-20 grams).

The last treatment is permitted no later than 45 days prior to harvest in the case of grapevines and 30 days for the remaining crops. During the course of a season, apples, pears, plums, cherries and potatoes can be sprayed no more than three times and grapevines -- only twice.

The preparation decomposes rather rapidly in the tissues of plants. The duration of the action for insects -- 10 days. In the presence of raised moisture conditions, it may cause scald on leaves and young shoots.

Chlorophos is of medium toxicity for warm blooded animals and it has an irritating effect on skin. It accumulates only weakly in an organism.

Chlorophos must be stored in properly working factory packaging materials.

7026
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MEASURES FOR PREVENTING POTATO LOSSES

Moscow ZASHCHITA RASTENIY in Russian No 1, Jan 85 pp 62-63

/Article by Ye.D. Kuznetsova, scientific secretary for the plant protection section of VRO of the All-Union Academy of Agricultural Sciences imeni V.I. Lenin: "Preventing Potato Losses"/

/Text/ A traveling joint session of the Plant Protection Section for Potato Production of the All-Russian Branch of VASKhNIL /All-Union Academy of Agricultural Sciences imeni V.I. Lenin/ and the Council of the Breeding Center of the Scientific Research Institute of the Potato Industry was held in the city of Yoshkar-Ola. During this session, a discussion took place on the problems concerned with protecting potatoes against pests and diseases and on the breeding of resistant varieties. Approximately 300 individuals participated in the session, including kolkhoz and sovkhoz specialists and leaders and also the secretaries of rayon party committees in the Mari ASSR.

The conference was opened by the secretary of the Mari Oblast CPSU Committee F.A. Khokhlov.

The director of NIIKKh /Scientific Research Institute of Potato Growing/ A.I. Zamotayev delivered a report on potato production. He placed emphasis on the chief conditions for successful potato cultivation -- timely loosening of the soil, applications of balanced fertilizers, combating pests, diseases and weeds, selection of the best varieties for planting, observance of the optimum sowing periods and the planting of small tubers. This crop should constitute no more than 40-50 percent of a crop rotation plan.

The deputy minister of agriculture for the Mari ASSR, V.M. Platonov, discussed measures for increasing potato production at kolkhozes and sovkhozes in the Mari ASSR. He emphasized the importance attached to combating potato blight and the Colorado potato beetle. Inter-row hoeing is being combined with pesticide applications on the farms.

S.S. Pakhomova, the deputy director of NIIKKh and Hero of Socialist Labor, acquainted the participants in the conference with the improvements which have been realized in primary and intra-farm potato seed production. She noted that high quality potato plantings occupy only 70 percent of the areas in the Mari ASSR, whereas there are oblasts, for example Leningrad, Moscow and Bryansk, which have converted over completely to high quality plantings. In

1983, only one half of the farms were supplied with elite seed. Moreover, some farms have not received any elite seed for 3-4 years. Meanwhile, there have been instances of elite seed being used for purposes other than those than originally intended: not for seed purposes, but rather for food, forage or other purposes far removed from seed production.

S.N. Karmanov, the deputy director of NIIKKh, described the new potato varieties Ramenskiy, Nevskiy, Temp and others, all of which are characterized by high productivity. In order to take advantage of the potential offered by the new varieties, use must be made of the appropriate agricultural practices. Unfortunately, by no means is this factor being taken into account in all areas.

VASKhNIL Academician K.Z. Budin paused to discuss the species and specific hybrids of potatoes -- genetic sources for immunity against potato blight, viruses, the potato nematode and the Colorado potato beetle. He pointed out that a combination of high potential productivity and immunity against diseases, pests and unfavorable environmental conditions is possible only when use is made of the method of interspecific hybridization.

I.M. Yashina (NIIKKh) noted that the problem of improving the immunity against the most damaging potato disease -- potato blight -- can be solved successfully only if an all-round approach is employed. The retention of a level of immunity in varieties under cultivation is promoted by the existence of vertical and horizontal immunity in the host-plant, the selection of varieties in agricultural production taking into account the racial composition of the pathogen and the use of effective methods for protecting potato plantings against a pathogen.

The speaker also discussed the problems concerned with creating varieties having a high field immunity against a complex of viruses and the selection of lines which are immune to a group of pathogens, the pathogenicity factor of which is a toxin (pathogens for ring rot, brown patch, macrosporiosis and fusarial wilt).

The head of the Department of Plant Protection at NIIKKh, A.S. Volovik, furnished an analysis of modern methods for forecasting diseases, he provided information on the prospects for carrying out studies in this direction and he discussed methods for countering infection in seed material, including methods for decontaminating it prior to storage or planting. The extensive use of chemical disinfection methods is being held up by a lack of machines. Fine prospects are at hand for treating tubers with biologically active substances; this will raise the resistance of plants and tubers to the pathogens.

V.I. Kurilov (BelNIIZR) discussed the all-round protective system for potatoes that has been introduced into operations at kolkhozes and sovkhozes in Belorussia. This system is directed towards suppressing all of the principal harmful organisms during all periods in the cultivation and storage of a crop. The system is based upon a consideration of the economic thresholds for damage and upon selecting the most reliable and safe means of protection. However, its introduction into operations requires the rapid development of mechanized equipment for the chemical disinfection of tubers and measures for combating the bacterial diseases of potatoes, the harm from which is increasing with each passing year.

The head of a laboratory at NIIKKh, Yu.I. Shneyder, outlined the status and prospects for combating potato bacteriosis. As a result of studies carried out at NIIKKh, TSKhA /Timiryazev Agricultural Academy/, the Institute of Experimental Botany and VIZR /All-Union Institute for the Protection of Plants/, recommendations were prepared for combating this group of diseases, including those involving mixed rots.

G.A. Kononova (VIZR) acquainted the participants with the theoretical prerequisite for rapid-forecasting of concealed potato infection by pathogens, based upon a physiological change in the tissue of sick tubers. As a result of pathogenesis, structural changes take place in the membranes and their permeability is raised. This indicator can be recorded with the aid of a spectrophotometer.

G.P. Avezdzhanova (VIZR) provided information on the harm caused by bacterial rot during storage and on the methods used for suppressing such rot under production conditions.

V.A. Shmyglya (TSKhA) discussed methods for obtaining healthy planting stock and for accelerating their reproduction.

I.P. Damroze (Problem Laboratory for Virus Diseases of the Latvian SKhA /Agricultural Academy/) delivered a report on forecasting the appearance of aphids -- the carriers of potato viruses. He emphasized the need for the organized development of a system for observing the more important carriers of viruses in the zones of intensive potato production.

The use of aviation for combating diseases and pests during the potato growing season was discussed by A.I. Tubol (Krasnodar Branch of GosNIIGA /State Scientific Research Institute of Civil Aviation/. Combined treatments using various preparations and a working liquid expenditure of 25-50 liters per hectare are being used for combating potato blight and the Colorado potato beetle. UMO is being introduced into operations with centrifugal liquid diffusers being installed in the sprayer booms of an An-2 aircraft and serially produced diffusers with a 1 millimeter diameter for the discharge openings -- for the Ka-26 helicopter. For the UMO, use is being made of special factory produced preparations which do not require water dilution (ritsifon -- 3 liters per hectare, dibrom -- 2.5 liters per hectare).

VNIIF /All-Union Scientific Research Institute of Phytopathology/, jointly with the Belorussian Scientific Research Institute for Potato and Fruit Production and the Krasnodar Branch of GosNIIGA, has developed a technology for protecting potatoes against potato blight. This technology is based upon the use of a low volume spray (15-25 liters per hectare) of industrial fungicides, in a mixture with a water solution of carbamide (urea).

V.M. Glez (NIIKKh) drew the attention of the participants to the fact that in addition to the Colorado potato beetle and the 28-spot potato lady bug, a great threat to the country's potato production operations is posed by the potato moth. Studies carried out at VNITIKiZR provided preliminary data on the developmental periods for this type of insect, on the number of generations under field conditions and in storehouses, on the feed base and on the effectiveness

of chemical and microbiological preparations for combating the potato moth and also pheromones for revealing butterflies. A study of its local entomophages has commenced.

In the resolution adopted during the conference, emphasis was placed upon the need for intensifying the introduction into production operations of scientific developments in the area of plant protection and also breeding for immunity to pathogens. The recommendation has been made to have NIIKKh, TSKhA, VNIIZR /All-Union Scientific Research Institute for the Protection of Plants/, VNIIKhSZR /All-Union Scientific Research Institute of Chemicals Used for Plant Protection/ and some other institutes initiate studies for developing an effective system of measures for combating potato rot during storage.

7026
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DEVELOPMENT PROGRAM

Moscow ZASHCHITA RASTENIY in Russian No 12, Dec 84
pp 2-3

[Editorial]

[Text] Our country has entered into the fifth, final year of the 11th Five-Year Program. Soviet people have made great achievements; they are faced with enormous and difficult tasks, but will perform them successfully. This is guaranteed by the wise, scientifically validated policies of the CPSU, the inalienable unity of party and people, their desire to firmly follow Lenin's path. The agricultural policy of the CPSU, the present phase of which began with the decisions of the March (1965) Plenum of the Central Committee, gained further development at subsequent party plenums and congresses. The May (1982) Plenum of the CPSU Central Committee, which approved the Food Program, played a special part in this.

Only 2 years have elapsed since the Food Program was approved, but it can already be firmly stated that this was a fruitful period. Overall agricultural output in 1983 and 1984 will constitute about 20 billion rubles more than in the first 2 years of the five-year program. Some positive changes have taken place in livestock farming.

At the same time, the rate of increase in agricultural production still does not meet the increasing demands. One cannot fail to take into consideration that our agriculture is practiced under difficult climate conditions. More than 60% of the plowed fields and 70% of the farms are in a dry zone, while a considerable part of the fields is in regions of excessive precipitation.

The CPSU Central Committee and government, having analyzed the state of affairs in agriculture, deemed it necessary to implement additional long-term measures on a broad scale to intensify agricultural production. The October (1984) Plenum of the CPSU Central Committee will be an important landmark in future development of the agroindustrial complex.

The main element in the decisions of the October (1984) Plenum of the CPSU Central Committee is concern about the consistent rise in standard of living of Soviet people. The additional large-scale steps discussed by the Plenum are aimed at transforming agriculture into a highly developed sector of the economy. "... We are not dealing here with shifting the emphasis in our

directives," stressed Comrade K. U. Chernenko, general secretary of the CPSU Central Committee, in his speech at the Plenum, "but with a search for really innovative and creative approaches."

"Proceeding from this, the Central Committee is raising today the question of broad-scale deployment of land reclamation, viewing it as a deciding factor in further advancement of agriculture, stable build-up of the nation's food supply. It is planned to expand by 1.5 times, within a relatively short period of time, the areas of irrigated and drained land, which would double its yield of plant-growing products. Large zones will be established for guaranteed agricultural production on an industrial basis--grain, feed and vegetable factories. The nation will be able to receive almost half of all the production of agriculture from reclaimed land regardless of weather fluctuations.

The areas of irrigated and drained land increased from 17 million to 33 million ha as a result of reclamation performed after the May (1966) Plenum of the CPSU Central Committee. Virtually all of the main agricultural regions of our country have been covered with reclamation work. In 1983, plant-growing output on this land was in excess of 16 billion rubles, versus 6 billion rubles in 1965, while its share in the overall production volume increased from 20 to 33%. At the present time all of the cotton and rice, two-thirds of the vegetables, about half the fruit and grapes, about 40% of corn grain, 25% of coarse and succulent fodder are raised on irrigated and drained land. However, the vast possibilities of reclaimed land with respect to high and stable harvests of agricultural crops are not yet used to their full extent, and the capital investments and material and technical resources allocated for these purposes are not producing the needed return. In a number of areas, the harvest on irrigated land does not exceed the output on unirrigated [bogara] land. As a rule, low harvests are the result of inefficiency, slow adoption of industrial technologies, highly productive cultivars and hybrids of agricultural crops, poor use of fertilizers, agents for plant protection, equipment, and poor organization of watering.

The party has advanced the task to have all reclaimed land, each hectare used efficiently. For this reason, much attention is devoted to questions of reconstruction of irrigation and drainage systems, improvement of quality of building, introduction of industrial technologies, improvement of the structure of plantations on improved land. Comrade K. U. Chernenko stressed in his speech at the Plenum: "All that is needed must be issued in full for irrigated and reclaimed land: fertilizers, equipment, chemicals for protection of plantations, all other material and technical resources, including those for operation of systems."

The program of reclamation construction provides bringing up grain production on irrigated and drained land to 32.3 million tons in 1990, including up to 9.1 million tons of corn, 80 million feed unit tons of fodder and 22.5 million tons of vegetables on irrigated land. By the year 2000, the area of irrigated land will be expanded to 30-32 million ha and drained land to 19-21 million ha. They will produce up to 55-60 million tons of grain, including 18-20 million tons of corn, 115-125 million feed unit tons of fodder.

What then are the main directions of the long-term reclamation program? They are as follows: highly efficient use of all irrigated and drained land with every farm achieving the planned harvest within the specified time; acceleration of development of irrigated agriculture in the south of the country--North Caucasus, Volga region, Ukraine and Moldavia--in order to establish large zones of guaranteed agricultural output; continued construction of irrigation systems in republics of Central Asia, Kazakhstan and Trans-Caucasus; implementation of a set of reclamation projects in the Nonchernozem Zone of RSFSR, Siberia and the Far East, in the Wooded Region of the Ukraine, Belorussia and Baltic region; expansion at kolkhozes and sovkhozes, as well as interfarm associations, of irrigated fields with use of local run-off, subterranean water and drowned river valley irrigation.

It was noted at the October Plenum of the CPSU Central Committee that there must be serious improvement in the performance of the agrochemical service, scientific research institutes, administrators and farm specialists being made more responsible for proper use and high return on mineral and organic fertilizers, as well as agents for plant protection. There are provisions for the agricultural organizations, Sel'khozkhimiya [Scientific Production Association for Agrochemical Services to Agriculture] and Sel'khoztekhnika [Agricultural Production Equipment] enterprises must assume the obligation to provide for upkeep of reclamation systems and irrigation equipment in working order, application of mineral fertilizers and plant protection agents at the optimum time and in the required dosage. The farms assume the obligation to provide for planned harvests at the target dates and then the projected output, achieving the proper volumes of agricultural products.

The Ministry of Agriculture, kolkhozes and sovkhozes must bear responsibility for efficient use of the reclaimed land available to them, for using highly productive cultivars, making productive use of equipment, introducing industrial technologies, progressive methods and forms of organizing labor, implementing all measures related to augmenting harvests, including reduction of production costs. The work of all organizations, as well as farms, specialists, kolkhoz and sovkhoz workers, will be assessed according to end results.

It was stressed at the October Plenum of the CPSU Central Committee that acceleration of scientific and technological progress, introduction of progressive knowhow constitute the most important factor in improving the effectiveness of reclamation work, growth of labor productivity, wise use of water and land resources; the State Committee for Science and Technology, USSR Academy of Sciences, All-Union Academy of Agricultural Sciences imeni Lenin and sectorial institutes will have to bring their research closer to concrete tasks set forth in the reclamation program.

It is imperative to intensify work on development of new cultivars and hybrids of agricultural crops that would respond to irrigation and meet the requirements of industrial technologies, introduce to production disease and pest resistant cultivars and hybrids of corn with potential yield of 120-130 q, rice with yield of 60-80 and millet with yield of 35-40 q/ha. Special attention will have to be devoted to development of early and average maturing hybrids of corn, highly productive cultivars of perennial grasses, vegetables, cucurbits, fruit, berries and grapes. Technologies must be developed and introduced

that would permit raising 2-3 harvests of feed crops per year with a yield of 10-15 tons/ha feed units.

It was suggested that the Ministry of Agriculture and All-Union Academy of Agricultural Sciences imeni Lenin devote the utmost attention to questions of improving organization and increasing the benefits of scientific research. It is particularly important to intensify work in the area of soil science, investigation of means of increasing fertility and integrity of soil, acceleration of development of effective biological methods of protecting plants and the environment. Ultimately, all scientific research should be directed toward wise use of water and land resources, increased productivity and stability of agricultural output.

The Plenum of the CPSU Central Committee has outlined steps for environmental protection, since reclamation has, in a number of instances, an adverse effect on natural processes: there is increase in mineralization of river water, decrease in drainage of fresh water into reservoirs, water becomes polluted with fertilizers and herbicides, there is intensification of salinization and swamping of land. In his speech at the Plenum, Comrade K. U. Chernenko noted: "As extensive reclamation work is being done, we invade nature in some way or other. One should proceed very carefully so as not only to avoid harming the land as we transform it, but improve it, enrich it and multiply the potential of nature." K. U. Chernenko recalled the statement of K. Marx to the effect that people using the land must, like good heads of families, leave it improved for the next generations.

The decisions of the October (1984) Plenum of the CPSU Central Committee put some difficult and responsible tasks to specialists in plant protection in our country. A reliable barrier must be provided to prevent harvest loss due to pests, diseases and weeds, in order to recover maximum yield from reclaimed land! For this, complex systems of protection of agricultural crops raised on irrigated and drained land must be introduced everywhere, fuller use must be made of the capabilities of agricultural technology to suppress development of harmful organisms, introduce stable cultivars and expand the use of biological agents. It is important to make prompt, wise and efficient use of available methods and means, including chemicals, of protecting harvests.

It is necessary to become even more actively involved in the struggle to improve the sophistication of agriculture, increase efficiency of reclaimed land, recover high and stable harvests of grain, fodder and other crops. Implementation of the broad-scale program of land reclamation will be a worthy contribution to stable build-up of the country's food supply and further improvement of the welfare of Soviet people.

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TRAINING FOR SPECIALISTS IN PLANT PROTECTION

Moscow ZASHCHITA RASTENIY in Russian No 12, Dec 84
pp 4-5

[Article by Yu. V. Vsevolozhskiy, chief of the Main Administration for Higher and Secondary Agricultural Education, USSR Ministry of Agriculture, "Firm Knowledge for Specialists"]

[Text] Recently, the Politburo of the CPSU Central Committee discussed the proposals of Comrade K. U. Chernenko concerning some issues of modern cadre policy. The novelty and complexity of problems that are being solved in the course of improving well-developed socialism, the higher level of education and culture of the people impose higher demands of cadres, their business and ideological-moral image. In our country, we have really unlimited opportunities to replenish cadres with new forces by using the best representatives of the working class, kolkhoz peasantry, intelligentsia, women and young people. All this must be combined with use of experienced cadres of the older generation, so that young promising workers would labor with them, gain experience and acquire the necessary training. It is important to further improve the business and party-political training of cadres and to develop an effective reserve of cadres.

The questions discussed at the Politburo of the CPSU Central Committee also have a direct bearing on agriculture, further improvement of the performance of the green cross service. Below is a selection of articles dealing with training of highly qualified specialists in plant protection. The editorial board intends to continue with this discussion in other issues of this journal and invites readers to express their opinions.

Specialists in plant protection play an important part in fulfilling the USSR Food Program. Scientific agronomists are trained in this specialty at 20 agricultural VUZ's. In recent years, training was started at the Andizhan Institute of Cotton Growing. The plan for enrollment in the daytime department was increased by 21%. Agronomists specializing in plant protection with secondary education are being graduated from 14 agricultural tekhnikums.

In 1981, the USSR Ministry of Higher and Secondary Specialized Education approved the qualifications for a scientific agronomist in the specialty of "Plant Protection." This document established the professional designation for specialists who graduate from higher educational establishments after following daytime and correspondence forms of training, and the qualification requirements have been developed also for such specialists.

An agronomist in this specialty is trained for production-technological, organizational-management and research work in the field of protection of agricultural plants against pests, pathogens of diseases and weeds, for work in kolkhozes, sovkhozes and other agricultural enterprises, in scientific organizations in primary positions who are to replace specialists with higher education according to the standard lists of jobs. The specialist must be well acquainted with the fundamentals of Marxist-Leninist teaching, he must have wide erudition and culture, see clearly the political goals of the party and country; he must be a staunch patriot and internationalist, a worthy representative of the Soviet intelligentsia; he must combine broad basic scientific and practical training, continuously upgrade his education, expand his sociopolitical outlook, he must be able to apply in practice the guidelines for scientific organization of labor; he must be proficient in progressive methods of management of worker groups and have skills in political education work.

The inseparable elements that make up the level of professional training include knowledge of general theoretical and general biological disciplines to the extent needed for optimum solution of production and research problems; special disciplines for wise and scientifically validated protection of agricultural plants, as well as development of economics of the sector and enterprise; fundamentals of organization, planning and management of agricultural production, environmental protection, Soviet law, matters pertaining to patents and scientific organization of labor, provide for adherence to safety practices.

Such a specialized agronomist must be able to develop and implement plans for integrated plant protection, combine optimally agrotechnological, chemical, biological and other methods, implement quarantine measures, predict the deleteriousness of diseases, plant pests and weeds, determine the technical efficiency of all procedures for plant protection, as well as perform other types of special jobs in accordance with the duties that go with his position.

The standard curriculum in the specialty of plant protection has been revised with due consideration of the qualification requirements. We cannot fail to mention in this regard the major work done by the staff of the Department of Plant Protection at the Leningrad Agricultural Institute, who have conducted for 20 years scientific and methodological investigations to improve training of specialists with the highest qualifications. The scientific and pedagogic workers of Leningrad, Saratov, Stavropol agricultural institutes, Moscow Agricultural Academy, as well as specialists of the Soyuzsel'khozkhimiya [All-Union Scientific Production Association for Agrochemical Services to Agriculture] Association, participated in the revision of the curriculum. The results of this collective work made it possible to define with greater validation the list of disciplines, volume of educational material and correlation between theoretical and practical training.

In the new curriculum, 1300 hours, or over 30% of total hours of theoretical classes, are scheduled for disciplines referable to the plant protection cycle. In order to intensify practical training of specialists, the time for educational and production practice has been extended by 10 weeks; an introductory practical class has been added to the first semester (for 3 weeks) and production practice is scheduled for the sixth semester (6 weeks).

In order to achieve fuller conformity of specialist training to the requirements of developing production, specialization in biological plant protection has been added, which is offered at the Tashkent and Leningrad agricultural institutes. Specialization includes studies of the following disciplines: theoretical bases of the biological method (88 h), biological control of pests and weeds (66 h), genetic method and mass-scale breeding of useful organisms (44 h), biological control of plant diseases (20 h), integrated control and effect of pesticides on useful organisms (30 h).

Improvement of methods of teaching and training students and organization of the educational process on a modern material basis are important, and this will help improve placement of graduates in industry.

Much has also been done in recent years to train specialists with secondary qualifications at agricultural tekhnikums. New curriculums have been adopted, new syllabuses have been developed, combined practical classes on technology of plant protection were added, during which students study the zonal system of protective measures and organization of the plant protection service. Specialization in the biological method is offered at several tekhnikums.

We should like to say a few words about advanced training of agronomists in plant protection. In the last 3 years, at the 18 VUZ's where this work is being done, more than 3000 agronomists underwent training. The list of specialties has been expanded, and it now includes forecasting and reporting, the biological method, toxicology, radiology, phytopathology, entomology, phytohelminthology and others.

Professors and instructors at agricultural VUZ's must take into utmost consideration the requirements of the developing industry, inculcate firm professional knowledge in graduates, which they need to succeed in solving problems of improving the efficiency of agriculture, which have been formulated in the Food Program.

PHOTO CAPTION

Page 5. I. B. Usmankhodzhayev, first secretary of thr Uzbekistan Communist Party Central Committee, learns about the work in the Department of Biological Plant Protection at the Tashkent Agricultural Institute.

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PLANT PROTECTION SPECIALIST TRAINING--MATTER OF PARAMOUNT IMPORTANCE

Mocow ZASHCHITA RASTENIY in Russian No 12, Dec 84
pp 6-9

[Article by N. V. Bondarenko, chief of Department of General Entomology, Leningrad Agricultural Institute, professor, corresponding member of the All-Union Academy of Agricultural Sciences imeni Lenin]

[Text] In his speech to administrators of the plant protection service and students at the Higher School of Agricultural Management, the USSR minister of agriculture, V. K. Mesyats, stressed their special responsibility for the fate of harvests and mentioned the need for further strengthening of the phytosanitary service.

In our country, scientific agronomists specializing in plant protection are trained at a number of VUZ's. Highly qualified teams of professors and instructors have been formed in departments and faculties of plant protection (Timiryazev Agricultural Academy, Ukrainian Agricultural Academy, Kharkov, Tashkent and Georgian agricultural institutes, All-Union Agricultural Correspondence Training Institute and others). One of the country's oldest is the Faculty of Plant Protection at the Leningrad Agricultural Institute, which was founded on the basis of the Leningrad Institute of Pest Control (LINBOV) organized in 1929. Major specialists have worked at this institute at different times: academicians, Ye. N. Pavlovskiy and V. P. Pospelov, corresponding members of the USSR Academy of Sciences G. Ya. Bey-Biyenko, A. A. Yachevskiy and N. A. Naumov, professors M. N. Rimskiy-Korsakov, N. Ya. Kuznetsov, G. G. Yakobson, N. N. Bogdanov-Kat'kov, V. N. Shchegolev, G. Ye. Osmolovskiy, P. N. Golovin, Docent T. L. Dobrozrakova and many other instructors. Many generations of specialists in plant protection, entomologists and phytopathologists studied and received advanced training with the help of the textbooks, educational aids, guides and monographs of the above-mentioned major specialists.

The accumulated knowhow and rich traditions are carefully treasured and multiplied by the current staff of this faculty. There are 5 professors (doctors of sciences) and 11 docents (candidates of sciences) working in the departments. In accordance with the statute pertaining to the basic higher agricultural educational establishment, which was approved by the Main Administration for Higher and Secondary Agricultural Education of the USSR Ministry of Agriculture, the Leningrad Agricultural Institute was appointed curator for the specialty of

"plant protection." Six batches of specialists in plant protection and entomology instructors of agricultural VUZ's undergo training each year on the faculty for advanced training of this institute.

Development of a new curriculum, which was approved in 1983, was an important event in upgrading the quality of specialist training. This was preceded by meticulous work dealing with analysis of syllabuses for the disciplines studied, exclusion of duplication in teaching different disciplines, increasing the role of production training of students, etc. As a result, it was possible to restore technological practice in the third year, which was not in the preceding curriculum, without detriment to theoretical studies. In recent years, students traveled for production practice to farms and to plant protection stations only once in the fourth year, and not infrequently found it difficult to adjust to the intensive rhythm of spring work. This had an adverse effect on both their professional training and collection of material for their theses. Now they will visit the field twice, after completion of the third year (6 weeks) as qualified workers and after the fourth year for the entire season (17 weeks) for pregraduation practice. The time for preparing and defending dissertations has been somewhat extended.

The new curriculum includes, for the first time, specialization in biological plant protection. This is understandable, since there are already 1380 industrial biological laboratories and biological factories in the country, and their number is growing with each year. This specialization was added on 1 September 1983 at the Tashkent Agricultural Institute and in 1984 at the Leningrad Agricultural Institute.

I am sometimes asked how introduction of the specialty of biological methods will affect the quality of specialist training. I can boldly state that this category of graduates will even have some advantages, because they study to a full extent both the disciplines that are taught without specialization and additionally attend an in-depth theoretical course (230 h); they will participate in production practice, write a thesis on biological protection of plants. Students who do not specialize in the biological method study biological protection for 85 h, and by decision of the faculty council, use the remaining 144 h for additional study of special disciplines.

In order to receive the necessary professional training, while at the institute students must assimilate much factual material and acquire practical skills. This can be done with the help of a large arsenal of procedures and aids available to instructors. They include lectures, laboratory classes and seminars, educational, technological and production practice, organization of course projects, plans, defense of thesis, involvement of students in educational (UIRS) and scientific research (NIRS) work.

The lectures, most of which deal with a particular problem, are delivered by professors and experienced docents. Laboratory classes on most topics are planned in such a way that students work independently, receiving the necessary material and using reference tables. Let us mention that, thanks to the great assistance of the Main Administration for Higher and Secondary Agricultural Education of the USSR Ministry of Agriculture, students are provided with textbooks and educational aids for laboratory work, which are updated periodically.

Various methods are used to assess current achievement of students in the departments of the faculty: seminars, exams, noncomputer and computer programmed exams. Let us mention, in particular, a very convenient form of computer checks using the Signal-1 device. It is portable, can be readily carried from one auditorium to another and does not require any specially equipped rooms. The students are given multiple choice answers, and all are given in correct form, rather than distorted as stipulated in other programmable units. To check knowledge about different morphological distinctions it is sufficient, for example, to issue to students a printed copy of the structural diagram of some organism with digital keying of all its numerous elements and the problem, which consists of 6-7 questions, to answer which it is necessary to input the required numbers on the panel of the unit. Signal-1 can also be used for self-checks by a student in the case of independent studies.

In some cases, one has to resort to other procedures for better assimilation of material. Here is an example. For a long time, it was not possible to obtain firm knowledge in systematics of insects and general entomology as a whole, because most of the time for the 3-4 days usually scheduled for preparing for exams during the period of an examination session was spent by students on learning Latin and Russian names to the detriment of reviewing material for the entire course (particularly insect ecology). As a result, even the hastily memorized Latin names were quickly forgotten. The situation changed when a list was compiled of Russian and Latin names of the main orders and families, which included 2-3 representatives of harmful and useful insects in each family. The list is issued to each student at the start of the course. The student also has the right to give the instructor all of the names on the list or parts of it over two semesters, with repetition at the last test. In this way, we were able to improve achievement considerably, not only in this discipline, but in agricultural entomology, since many insect names only had to be reviewed in the senior year, rather than memorized anew.

At present, when the flow of information is growing constantly, it is necessary to teach our students how to work independently with specialized and scientific literature, instill in them skills in planning and setting up experiments. We are solving this problem by involving students in UIRS and NIRS, as well as performance of course and thesis papers.

All of the students on the faculty are involved in scientific research starting in the third year, and for this purpose the educational department of the institute schedules a special time so as to collect all students of the faculties at the same time for lectures, seminars and meetings of student scientific circles. A considerable part of the students start to visit the departmental laboratories on an extracurrical basis in the first and second years.

Much attention is devoted by instructors to performance (over the entire period of training) of six course papers and two course drafts in special disciplines, including defense of a report on production practice. The topics of the papers reflect the basic parts of the discipline studied. Supervisors require students to use primary sources, scientific papers published in the periodic press in preparing their papers, to teach them how to review and acquire their own opinion on the topic studied, particularly when there are

contradictory opinions in the sources. The nation's unique index of the periodic press in the VIZR [All-Union Institute of Plant Protection] library, which is kindly made available by its management, is very helpful in independent selection of literature on a given topic.

Students are particularly encouraged to conduct their own experiments, observations, to gather and identify material for collections in entomology and phytopathology in performing the relevant course work, and for this reason assignments are given at the beginning, rather than the end of a course. In addition, it was possible to prepare the schedule, for general entomology for example, in such a way that studying the discipline is interrupted for summer learning practice. This is helpful in performing experiments and observations which are needed to write the course papers (assigned in the spring and defended in the winter), as well as in reinforcing knowledge on systematics and faunistics of insects, gathered during the period of practical work.

It is important to stress that instructors fight for active practical training. During practical work on general entomology, for example, second-year students not only learn about useful and harmful fauna of different agrobiocenoses and methods of keeping records of it, but they provide quantitative estimates of specific dominant species with subsequent analysis of the results obtained by the group at the end of the day in the laboratory. During training practice the following (third) year, they use methods already learned to solve practical problems (for example, whether or not to use an insecticide to treat a given cultivar against a concrete pest species), and they have to know how to estimate the population density of the pest, its entomophages, consider the economic threshold of harmfulness and level of effectiveness of natural enemies.

It has become mandatory to give a public defense of term papers at other than class time, before a commission consisting of 2-3 instructors in the department and in the presence of a group of students who can also pose questions. Such organization of practice makes it easier to assimilate the educational material, since the brief student papers shed light on at least half the course studied. At the same time, they gain experience in speaking before an audience, they acquire skill in presentation of special material and they learn to answer questions, which will subsequently be very useful to them in defending dissertations. And it is not surprising that many of the papers prepared in the junior years with elements of scientific research develop into dissertations.

It is rewarding to state that dissertations are prepared and defended by all of the faculty students. Most of them deal with the topics of the scientific work of the departments on the basis of kolkhozes and sovkhozes, while some topics are those of scientific research institutions, in particular the VIZR. In the latter case, most of the material must be gathered at the experimental model farms or the base farm where the student works. Students are actively involved in final development and production testing of recommendations of departments and laboratories. For expressly this reason, 50-70% of the dissertations, in the opinion of the state examination commission, have elements of original research that merit introduction to agricultural production.

The course on experimental methodology, which is given by Docent M. K. Asatur in one of the special departments of the Plant Protection Faculty, is of some help in planning experiments, preparing protocols for experiments and statistical processing of obtained results. In the third-year laboratory classes, students solve problems that are contained in an educational aid, and some on the basis of their own experimental material by means of elementary calculators. Soon it is planned to use computers from the institute's computer center to solve problems of correlation and regression analysis.

Quite a few of the theses become the basis for candidatorial and even doctoral dissertations. Suffice it to mention that, at one of the traditional meetings of 1956 alumni, it was learned that almost half the former students had defended candidatorial dissertations. The faculty is proud of such alumni as K. V. Novozhilov, director of VIZR and corresponding member of the All-Union Academy of Agricultural Sciences imeni Lenin, and his deputy for science, K. Ye. Voronin, I. Z. Livshits, doctor of sciences and recipient of the USSR State Prize, V. A. Zaslavskiy, laboratory head at the Zoological Institute of the USSR Academy of Sciences, senior scientific associates at this institute--Ye. M. Dantsig, Ye. S. Sugonyayev, M. I. Fal'kovich--V. F. Samersov, director of the Belorussian Scientific Research Institute of Plant Protection, N. S. Karavyanskiy, laboratory head at the All-Union Scientific Research Institute of Fodder, and others.

Instructors are always informed about the graduates from our faculty. There are commissions at the institute that keep in touch with them. They are headed by faculty deans. The members of the commission visit graduates, especially during the first 2 years after graduation; they render needed help and, if necessary, find out why they failed to appear for work.

There is extensive use of the practice of periodic reunions of faculty alumni 10, 15 and more years after graduation, to which we also invite students. At these meetings, there is exchange of opinions between teachers and agricultural specialists.

As we know, the USSR Ministry of Agriculture has issued instructions to add positions of agronomists for plant protection at all farms (and, first of all, those engaged in intensive agriculture), increasing the responsibility of this category of specialists for careful, efficient and economic use of agents for plant protection. I should like to address the administrators and chief specialists of farms that need qualified plant protection agronomists. Send your representatives to our faculties and departments of plant protection at agricultural VUZ's! You can refer to the daytime department any graduate of secondary school with 1-year tenure in agriculture or after being discharged from the Soviet Army, with payment of a scholarship at the expense of the enterprise. In this case, he would be enrolled without participating in a competition, provided he passes all the entrance examinations. If secondary school graduates require to supplement their knowledge, they can also be enrolled out of competition in preparatory daytime classes (with payment of scholarship and provision of dormitory) or in the correspondence training department. They will be enrolled out of competition in the event they pass the final exams in that department.

Individuals who are working in their chosen specialty are accepted in the correspondence training department of plant protection faculties, with a 6-year training program. If, however, they already have had higher nonspecialized education and work in the field of plant protection, at the request of a farm or plant protection station they can be enrolled in a higher grade without entrance examinations with credit for the disciplines that correspond in scope to the curriculum for the second specialty.

It is an equally important task for higher agricultural educational establishments to organize advanced training for agricultural specialists. We have as students here agronomists specializing in plant protection and from report and forecast centers, specialists of biological production laboratories and biological detachments, agronomists dealing with plant quarantine, specialists in fumigation detachments and phytopathologists.

The relevant instructions call for a 3-month advanced training period (after every 5 years of production work). However, in the last few years, the classes have been reduced to 2 or even 1.5 months, and no more than 60% of the time is scheduled for the study of specialized disciplines. Consequently, there remain 10-15 h for each discipline. It is particularly undesirable to shorten the training time for individuals with higher, but not specialized education, let alone those who worked after graduating from a tekhnikum and sometimes secondary school. After all, the professional training of plant protection agronomists differs substantially from the training of field-crop growers and fruit and vegetable growers. In the period of training at the VUZ they master 12 special disciplines covering more than 1200 h; they attend a total of more than 30 weeks of classes, technological and production practice; they prepare six term papers in the special disciplines and a thesis, whereas students in related specialties cover only 3 disciplines totaling 176 h and 4 days of practical training, thereby receiving only general information about plant protection.

On the example of the Leningrad Agricultural Institute, we can see that fewer specialists in plant protection with higher specialized education and more of those with higher agronomic or secondary specialized education come to the FPK [faculty for advanced training], and over half of them have less than a year's tenure in plant protection work. Such students cannot independently prepare a specimen for microscopy in diagnostic classes, cannot differentiate between a beetle and a bug, while some have to be taught elementary procedures for handling a microscope. Of course, such a contingent does not require upgrading of qualifications that it has not yet acquired, rather, it needs basic retraining.

The best way to deal with this situation would be to organize retraining courses for individuals without specialized education at FPK's of agricultural VUZ's with a 9-10-month training period. At one time, such a practice existed at the Institute of Zoology and Phytopathology (IZIF), where individuals with general agronomic education studied for 2 years in the winter, whereas in the summer they worked at their farm.

In order to eliminate some of the shortcomings we have mentioned, the Main Administration of Higher and Secondary Agricultural Education, USSR Ministry of

Agriculture, has allowed the institute to retain the 3-month period of advanced training for all students consisting of specialists of production biological laboratories and biological detachments, as well as agronomists working in the field of plant protection and at reporting and forecasting centers without higher specialized education, and the curriculums for the last two groups provides for maximum increase in class time scheduled for specialized disciplines and graduation tests. A 2-month period of preparation with a final abstract instead of an exam has been established for plant protection agronomists and those working at reporting and forecasting centers who have higher specialized education.

Unfortunately, one does not perceive a concern on the part of quarantine inspectors about advancing qualifications of plant quarantine agronomists. The impression is formed that some of the inspectorate workers do not particularly bother with education. Here is an example: it happened that in answer to the instructor's suggestion to define insects in a laboratory class, one of the female students gave the following response verbatim, almost in the style of Fonvizin [18th century writer of comedies]: "I do not deal with definitions on the job, I transmit all of the material to the laboratory and there it is identified." A reasonable question arises: Are not the mistakes made in the very responsible work of the plant quarantine service related to such an attitude toward studying?

In our country, there are more than 35,000 specialists in plant protection and quarantine. This means that just to fill the naturally occurring vacancies (6%) at least 2500 plant protection agronomists must be trained each year. However, the annual graduates do not even constitute half this number. In spite of this, plant protection agronomists are not listed among the specialists who are scarce, and highly qualified pedagogic teams of VUZ's are working at half their capacity. At the Leningrad Agricultural Institute, for example, only two groups of students are accepted on the plant protection faculty, one for their basic specialty and the other for specialization in the biological method; at the Timiryazev Agricultural Academy and several other major VUZ's, only two groups are also accepted each year.

As we see it, the reason for this is a flaw in the system of planning and using agronomists in our specialty. The plant protection service has much in common with the medical and veterinary services, while the decisions made by plant protection experts are sometimes even more responsible in their potential consequences to man, animals and the environment than those of a veterinarian. Yet, while it is mandatory to have a diploma of specialized education to be hired to work at a polyclinic, the formed tradition for replacement of plant protection specialists is even not to require the diploma. For expressly this reason, vacancies that open up are often taken by individuals without specialized education who learned the rudiments of their new profession by the method of trial and error, which is very expensive to society.

A solution to the situation that has developed is to add to the by-laws of the plant protection service and by-laws of the plant quarantine serice an explicit requirement that relevant positions must be replaced only by individuals with specialized education and that pesticides of average and high toxicity be

furnished only to the farms and organizations on the staff of which there are accredited agronomists specializing in plant protection with higher or secondary education.

These suggestions have already been discussed in ZASHCHITA RASTENIY (for example, in No 12, 1977) and their implementation would improve significantly the effectiveness of plant protection.

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PROGRESS REPORT OF USSR MINISTRY OF AGRICULTURE

Moscow ZASHCHITA RASTENIY in Russian No 12, Dec 84
pp 12-13

[Text] On 9 October of this year, the board of the USSR Ministry of Agriculture discussed the question of "Urgent steps to improve chemical protection of plants, mechanization of work and scientific research in this field." V. I. Martynenko, vice-chairman of the Soyuzsel'khozkhimiya [All-Union Scientific Production Association for Agrochemical Services to Agriculture] Association and chief of the Administration for Plant Protection, delivered a report. He observed that, at the present time, integrated principles are applied on an increasingly broad scale for plant protection. Combined systems of special measures have been developed and are being introduced, which provide for use of organizational-management, agrotechnical, breeding-genetic and biological methods, wise use of pesticides with due consideration of proportion of harmful and useful species.

Intensification of agriculture and the change to industrial technology for raising agricultural crops make it necessary to increase the volume of pesticides used, as well as to refine and expand their assortment. Thus, from 1965 to 1983, the volume of chemicals used for plant protection increased by 2.8 times, while the areas treated with them with consideration of frequency of treatment increased by 2.2 times (from 81.2 to 182 million ha). The increase in volume of chemical treatments was attributable essentially to expanded use of herbicides.

"In spite of the fact that there has been considerable expansion of pesticide production and assortment," said V. I. Martynenko, "there is still the acute problem of providing agriculture with chemical agents for plant protection. For example, of the 520 products recommended only 154 are being produced. Out of 100 herbicides, only 40 are produced, 30 out of 70 insecticides and acaricides, only 17 out of 65 fungicides and growth regulators, etc."

The existing assortment of chemicals is still inadequate for highly effective protection of cultivars against a number of pests, diseases and weeds. This applies in particular to such pests as the cereal leaf beetle, Colorado beetle, diseases such as wheat smut, rust and powdery mildew of wheat, Phytophthora infestation of potatoes and others. The limited assortment of herbicides is resulting in development of resistant weeds. Some pesticides that are used for plant protection have long since become obsolete. Not enough scientific

research is being done on synthesis of new agents that would meet all modern requirements. This also applies to theoretical studies of the mechanism of action and bases for pesticide synthesis. The technology for applying the products is still being poorly refined, particularly with respect to use of small and ultrasmall sprayers and aerosols.

There are also some serious flaws in studies dealing with development of economical technologies for using pesticides, defining scientifically validated standards for dosage of agents and working fluids.

"There are problems also in furnishing modern machines and equipment for plant protection to agriculture," noted V. I. Martynenko, "in our country about 30% of the volume of special measures are being performed by agricultural aircraft and 70% by ground-based machines; spraying plants is practiced the most extensively. Progressive technologies have been recommended to industry for treatment with pesticides, which permit wise, economical and, at the same time, efficient use of products, as well as drastic reduction of environmental pollution. The All-Union Institute of Plant Protection has developed agrotechnical specifications for making small and ultrasmall sprayers. Since output of such equipment has not yet been set up, series produced equipment is being adapted for this purpose. There are developments for strip application of agents, discrete spraying of orchards, use of nematocides, treatment of plants in protected soil that make it possible to reduce outlay of pesticides and working fluid and increase the efficacy of the chemical method. However, they have not yet come to practical use."

Although production of special machinery has almost doubled in the last few years, the demand for it is only two-thirds met, and this applies in particular to sprayers. There are also objections to the quality of the equipment that is produced. Much loss of working fluid occurs, the standard dosage of agents is not adhered to and rules for using them are not followed. Out of the four so-called "intermediate tractor sprayers" for protection of the main agricultural crops, thus far only three are used, OUM-4, OPV-1200 and OPSh-15. The industry's requirements with respect to high-capacity seed-treating equipment are being satisfied poorly. It is imperative to accelerate production of such equipment to treat seeds with use of film-forming compounds and to organize the output of units for thermal disinfection of seeds. Output of a unit for preparing pesticide solutions, machines for application of granulated and microgranulated pesticides and herbicides in perennial plantations, treatment of seed potatoes and use of biological agents has still not been organized.

The following participated in the discussion of this matter: N. F. Tatarchuk and N. A. Stolbushkin, deputy USSR ministers of agriculture; N. M. Golyshin, academician-secretary of the Department of Plant Protection of VASKhNIL [All-Union Academy of Agricultural Sciences imeni Lenin]; K. V. Novozhilov, corresponding member of VASKhNIL; department heads I. N. Veletskiy at the All-Union Institute of Plant Protection, V. A. Sanin at the Ukrainian Scientific Research Institute of Plant Protection and G. Ye. Tseruashvili at the Georgian Scientific Research Institute of Plant Protection; Yu. M. Veretennikov, chief specialist of Soyuzsel'khozkhimiya, and others.

V. K. Mesyats, USSR minister of agriculture, delivered a major speech to the board. He commented on the timeliness and importance of the issue discussed,

the business-like and concrete nature of the discussion. There is every opportunity to improve the effectiveness of plant protection, and no new decrees need to be adopted for this; one should check once more implementation of the old ones, for there is also much in them that has not been done but will be in effect in the next few years. They contain the foundation that opens up a wide road for creative work.

V. K. Mesyats stressed: "Much depends on us. Intensification of production does not refer solely to extensive use of chemicals. Sometimes we rely on chemicals in all instances for plant protection, forgetting about agrotechnological and biological methods. The change to integrated systems, which provide for utmost use primarily of preventive measures, wise use of pesticides locally at the sites of reproduction of harmful species, with consideration of economic thresholds, has not taken place everywhere."

A few years ago, we discussed at a board meeting the experience gained in Tajikistan in the area of introducing integrated plant protection, gave our approval and recommended it for broad use. However, it has still not gained the wise use it deserves. At the present time, entire oblasts in Uzbekistan are changing to protection of cotton using only biological agents. The Politotdel Kolkhoz, which is known to everyone, is giving the example. We should arm ourselves expressly with this knowhow and disseminate it.

The questions discussed by the board should also be discussed by Soyuzsel'khozkhimiya, at the All-Union Institute of Plant Protection, Department of Plant Protection and Presidium of VASKhNIL, and a clearcut program of action must be developed. There should be discussion of development of scientific research, economic use of pesticides, strict adherence to established standards and regulations for dosage of agents and working fluid. All chemical treatment should be done only after a thorough inspection of fields, when other methods did not yield the desired results. There must be broader development of research to improve the chemical method of plant protection, synthesize new agents, develop progressive technologies and mechanization equipment together with the USSR Academy of Sciences and other agencies; development and production of special equipment must be coordinated with the production of specific chemicals.

It is very important to teach all who are involved in plant protection to make educated and economical use of chemicals, and to adhere strictly to technological discipline. For there are still instances when hundreds of tons of expensive and potent pesticides are wasted, and superfluous applications are used. We buy many agents for plant protection abroad, but sometimes do not use them wisely. Stricter demands should also be made of the quality of such agents.

"There is another important matter," stressed V. K. Mesyats. "The successs of industrial and intensive technologies for production of agricultural crops depends largely on how promptly and efficiently we shall use all of the methods and agents for plant protection, rather than chemicals alone. The most serious attention has to be given to this."

As for increasing production and assortment of pesticides, mechanization equipment and improving their quality, these questions will be put to the agencies concerned.

The decision adopted by the board noted the flaws in organizing chemical plant protection, mechanization of work and scientific research in this area. It was suggested that effective control be organized of introduction of integrated systems and use of pesticides. Steps were outlined to activate scientific research dealing with the chemical method of plant protection.

Concern About Cadres

A conference at the Exhibition of Achievements of the National Economy of the USSR was devoted to improvement of work with personnel in Sel'khozkhimiya [agrochemical services to agriculture] associations. There was discussion of the problem of appointing cadres, advancing their training with due consideration of introduction of progressive methods and technologies.

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WORK IN LABORATORY OF MOLECULAR AND BIOLOGICAL BASES OF PLANT IMMUNITY

Moscow ZASHCHITA RASTENIY in Russian No 12, Dec 84
pp 14-17

[Article by Yu. N. Fadeyev, academician of the All-Union Academy of Agricultural Sciences imeni Lenin]

[Text] In recent years, the problem of protecting grain crops against root rot has become one of the most important ones in the entire world. This is related primarily to the fact that the share of grain crops constitutes 70% or more in many instances, in the structure of planted fields. This leads to repeated sowing of the same crops and, as a consequence, accumulation of specific infection in the soil.

Concentration of grain plantations is an objectively necessary process, and for this reason scientists are faced with the task of finding a way to lower the distribution and harm of root rot within the limits of the actually established systems of agriculture.

In order to successfully and competently develop and implement the necessary steps to control root rot of grain crops, one must also be well-informed about the causes of its development and manifestation of deleteriousness. The very concept of "root rot," as we know is collective and includes diseases caused by different species of fungi. A distinction is made between fusariosis, cercosporellosis, helminthosporiosis, "ophiobolous"[?] and other types of rot (there are about 30 species of pathogens), caused by the corresponding fungus species or mixed infections, for example, helminthosporiosis-fusariosis rot, etc.

There is also a difference in manifestation of the damage done by rot. On severely infected soil and when severely infected seeds are sown, there is mass scale loss of shoots. Depending on the type of fungus, the roots or near-root part of the plant or stem is damaged in vegetating plants, which leads both to direct decline of harvest and stem brittleness, and these cause even more losses. And they can be sizable. Aside from quantitative loss, root rot leads to significant worsening of quality of grain. For example, good bread cannot be baked from grain recovered from sick plants.

Many of the factors instrumental in or inhibiting development and manifestation of damage of root rot have been studied quite well to date. This made it possible to elaborate scientifically validated recommendations for its control,

including an extensive set of agrotechnological, seed-growing, organizational-administrative, biological and chemical procedures that lower substantially the harm inflicted by root root.

However, the weakest point in this system of steps is that there are no cultivars with resistance to root rot. Among the existing cultivars that have been zoned, there are some with relatively high resistance, but on the whole their resistance is low and does not solve the problem of radical improvement of phytosanitary condition of fields.

In this connection, it is imperative to pursue purposeful breeding of highly resistant and hardy cultivars of the main grain crops and, first of all, winter and spring wheat, which is the first and foremost task.

One of the most important prerequisites for successful breeding of such cultivars is in-depth investigation and comprehension of the mechanisms of interaction between the pathogenic fungus and host plant, causes of dissimilar sensitivity and tolerance of plants and differences in aggressiveness of fungi.

Expressly these considerations served as grounds for including in the program of research of the VNIIPMBiG [All-Union Scientific Research Institute of Applied Molecular Biology and Genetics] the study of biochemical and molecular-biological bases of resistance of grain crops to root rot. Wheat and two of the most important species of root rot pathogens--the fungi Bipolaris sorokiniana (Helminthosporium sativum) and Fusarium culmorum--were chosen as the main objects of investigation.

Methods were developed in the laboratory for quantitative evaluation of intensity of damage to wheat seedlings by pathogens of root rot, intensity of toxin production; determination was made of the effect of fungal toxins on development of disease and corresponding enzymatic systems of the host plant; methods were developed for isolation and purification of toxins. Work has also begun on assessment of the effect of root rot on the quality of spare proteins of grain, intensity of photosynthetic processes and plant productivity.

A team of researchers headed by G. A. Tarabrin, senior scientific associate, is studying interaction of pathogenic fungi with wheat plants.

With regard to several grain cultivars, it was shown that there is a link between the amount of endogenous fungicidal substance--Dimboa glucoside--they contain and resistance to different diseases (corn resistance to root and stem rot, wheat to several strains of stem rust, etc.).

Special laboratory experiments defined the resistance of 12 wheat cultivars (with 10-fold difference in levels of Dimboa-2-glucoside) to pathogens of helminthosporiosis and fusariosis root rot. It was learned that it is not controlled by the amount of this fungicide. When this group of cultivars was infected with 7 strains of B. sorokiniana and 5 strains of F. culmorum, the coefficients of correlation between glucoside content and damage score were in the range of 0.05 to 0.4.

Subsequent experiments revealed that wheat cultivars differ substantially in resistance to these two species of pathogens. Resistance depended strongly on

infection burden: with 25-50 conidia per grain, the cultivars presented a 3-fold difference on the 14th postinoculation day in damage score: with a load of up to 200-1000 conidia per grain, cultivar resistance to both pathogens became specific, damage score rose significantly, while the range of fluctuations in damage to different plants became narrower.

Infection of wheat at different times (ranging from inoculation of dry grain before sowing to inoculation of 8-12-day seedlings) revealed that sensitivity to root rot was highest at the very earliest stages of emergence. Maximum involvement was elicited by inoculation of conidia of root rot pathogens (seed infection). Infection of wheat seedlings 3 or more days old revealed that they were already much more resistant to disease. The damage score for these plants was 1/2-2/5ths the score for plants developed after inoculation of seeds. When seedlings were inoculated the course of the disease was also slower. More than 20 combinations (wheat cultivar-pathogen strain) were tested in this way with each of the two species of root rot pathogens. And in all cases seed infection was notable for resulting in maximum involvement, yielded the largest number of plants with arrested growth after the seeds had barely sprouted or after the coleoptiles had reached 3-6 cm in size.

An increase in inoculum dosage when grain was infected at the early stages of "arousing" led to arrested growth and subsequent death of seedlings. It was assumed that grain is particularly sensitive at this stage to the effect of toxins released by the fungi. A low infection load usually led to mild damage, since the wheat seedlings had time to go through the most vulnerable phase of growth before the sprouting conidia synthesized a threshold concentration of toxin. With increase in load to more than 200 conidia per grain, there were virtually no plants with low damage score, whereas in laboratory tests it constituted 3-4 points, i.e., there was drastic increase in number of unsprouted seeds and plants that were subsequently unable to produce spikes.

Experiments with an acellular culture of B. sorokiniana filtrate containing toxin showed that there was inhibition of sprouting and growth of wheat grain after soaking for 2 h, but it had no effect on growth of 3-day seedlings. When such a filtrate was diluted, it still inhibited seed germination, but stimulated (up to 30% of control) growth of 3-day seedlings. Interestingly, inhibition of grain germination and coleoptile growth was high and the same when the culture filtrate of one of the fungus strains was both 2- and 4-fold diluted. This is indicative of the grain's capacity to selectively absorb toxin from soil solution, and it explains, to some extent, why strains that differ appreciably in capacity to synthesize toxin have the same high pathogenic activity.

Such arrest in plant growth and loss of seedlings are inherent in grain "soil fatigue," a phenomenon with which a monoculture leads to reduction of number of plants per unit area and prevalence of soil infection among the surviving, weakened plants.

The coefficient of correlation between the score for seed and 5-day seedling damage (estimated for 18 combinations of wheat cultivars and B. sorokiniana) was -0.93. This high inverse correlation is indicative of different mechanisms of resistance to the disease in grain and seedlings.

It may be that wheat cultivars differ in time of change in mechanism of resistance, which could cause differences in their reactions when resistance was assessed.

Toxin-synthesizing capacity was found in 70 strains of the pathogen of helminthosporiosis rot. The largest number of strains had average toxin-producing capacity. A comparison of level of toxin production and aggressiveness of 33 strains of the fungus, which was made using two wheat cultivars with inoculation of grain, revealed that there is no link between these two important parameters. It was learned that the three most aggressive strains formed culture filtrates with average level of toxicity. The culture filtrate from one of the six strains with minimal aggressiveness was found to be the most toxic. In other tests, a strain was encountered that did not produce toxin, but it was not aggressive. Consequently, toxin production is indirectly related to aggressive properties of the pathogens. This was confirmed by estimates of correlations between inhibition of wheat root growth by the toxins of 33 strains of the fungus and overall score for the damage they produced (aggressiveness) for two wheat cultivars. The coefficients of correlation were +0.01 for one cultivar (Koma) and +0.24 for the other (Relayns).

However, in spite of this mathematical "validation" of absence of link between level of toxin production and aggressiveness of pathogen strains, one should not dismiss the role of toxins in the possibility of pathogenesis of fungi on a live plant. As noted before, presence of toxins, and not their concentration, was of deciding significance to arresting seed germination and seedling growth.

Analysis of seedlings stricken by toxins of the fungus or inoculated with pathogens of fusariosis root rot revealed that activity of β-glucosidase (an enzyme, the activity of which is closely linked to viability of seedlings) of wheat seedlings decreased to 1/10th (as compared to the control), whereas the pathogen of helminthosporium root rot doubled the duration of high activity of seed α-amylase, which leads to fuller hydrolysis of stored starch in the caryopsis and, while there was some retardation of seedling growth, this was instrumental in better nutrition and development of the fungus.

In 1983, a special team was formed in the laboratory headed by V. P. Bogdanov, senior scientific associate, which undertook work to isolate toxin from F. culmorum and subsequently, from B. sorokiniana as well, and an investigation of the defense mechanisms of plants against these toxins, as well as a study of the effect of wheat root rot on quality of harvest.

The work on toxins will consist of two phases: isolation and identification of the structure of the toxin; determination of causes for 2-3-day plants to acquire immunity to this toxin, whereas germinating seeds are so sensitive to it. No doubt, onset of resistance is related to the start of protein synthesis in plants, and they either bind or split the toxin. The search for these proteins, their isolation and investigation of their mechanism of action could have major scientific and practical implications.

It is a known fact that root rot reduces harvests, but there is little information about the effect of this disease on grain quality.

A comparative study has been started in the laboratory of the grain of different wheat cultivars raised on a healthy and fungus-infected background. Special attention is being given to the quantity and quality of protein. A comprehensive description will be provided, on the molecular level, of changes in accumulation, composition and structure of proteins in ripening grain of wheat stricken with root rot using a system developed in the laboratory, which includes determination of total protein content and its fractions, quantitative assay of polypeptide composition of gluten proteins by electrophoresis in gel, as well as gel filtration of reserve proteins on sepharoses.

Hardiness of cultivars, i.e., capacity to retain productivity when stricken by a pathogen, is a very important property, along with resistance to disease.

Hardiness may be related to resistance of the photosynthetic system to various stress factors, including root rot. We already know that there is a rather close link between intensity of development of root rot and diverse stress factors, for example, excessive drying or moisture of soil and others.

The possibility cannot be ruled out that the greater stability of the process of photosynthesis and its different stages in stricken wheat plants will be related to resistance to disease. It is extremely important to establish such relationships in order to refine methods of early detection of plant specimens with high resistance to root rot.

In 1984, the group of the laboratory of physiology of agricultural plant productivity, which is headed by Ye. Ye. Bystrykh, senior scientific associate, joined in the study of mechanisms of interaction between pathogens of root rot and plants.

In 1974-1983, new experimental data were obtained in this laboratory, which characterize the specifics of the photosynthetic process in highly productive winter and spring wheat cultivars. It was established that the following are the distinctive features of the photosynthetic system of intensive cultivars at the early (10-15-day seedlings) and late stages of ontogenesis (heading, grain maturation): faster rate of electron transport reactions, greater intensity of all types of photophosphorylation, labile physiological regulation of photosynthetic energy metabolism, higher activity of dark stage of photosynthesis.

It was shown that the increase in energy efficiency of the photosynthetic system of some highly productive genotypes is achieved by different routes--either as a result of increase in activity of each photosynthetic chain of electron transfer, or increase in number of functionally active electron-transport chains per mg chlorophyll.

The high rate of formation of "recovery strength" at the early stage of photosynthesis and its intensive use in dark reactions of photosynthetic conversion of carbon have a beneficial effect on formation of high yield property in cultivars of the intensive type.

The obtained data indicate that such parameters of photosynthesis as photochemical activity of chloroplasts and duration of induction decline of delayed

leaf fluorescence could be used in breeding practice as physiological criteria when selecting wheat for productivity. Investigation of physiological activity of the photosynthetic system as related to root rot involvement of wheat plants will disclose new, previously unknown aspects of interaction between pathogens and plants.

On the whole, the wide front of studies of the fine mechanisms of interaction between pathogens of root rot and cereal crops will yield basically new general theoretical and methodological data of importance to in-depth comprehension of pathogenetic processes as a whole.

It should be stressed in particular that the tasks of the laboratory ensue from the main direction of research at the VNIIPMBiG--for development of methods and procedures of practical gene engineering. Demonstration of the key enzymes that determine resistance is a mandatory prerequisite and the first step on the road of gene engineering, i.e., purposeful change in the plant genome, particularly as applied to problems of plant resistance. These ensue from the well-known conception of "one gene--one enzyme." However, even long before gene engineering will be used in practice, investigations of biochemical, molecular-biological bases of immunity can yield valuable theoretical and methodological information for improvement of traditional breeding practices.

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BIOTECHNOLOGY OF VIRUS-FREE POTATO GROWING

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pp 16-19

[Article by O. S. Melik-Sarkisov, laboratory chief at the All-Union Scientific Research Institute of Applied Molecular Biology and Genetics]

[Text] In recent years, potato seed growing has developed into an independent field in many countries, that of producing virus-free planting material. Seed material is reproduced in so-called closed, specialized zones with limited migration of vectors. Apical meristem cultivation began to be used in recent years as a health-improving method. It results in an increment of 30 to 200% in potato harvest.

The investigations conducted in the laboratory of virus-free cultures of the institute demonstrated the difference manifested throughout the vegetation period between material improved by the widely used selection method and by the method of apical meristem culture. With the latter method, in all reproductions the material caused earlier appearance of simultaneous shoots, and flowering began 2 days sooner. There were considerable differences in the bush habitus, the experimental plants developed an assimilation system much sooner, its strength was considerably greater than in the contral, while the tops died off more slowly. The harvest was increased because of the faster accumulation of tuber biomass.

A study was made in the laboratory of the effect of physiological state of the potato tuber and time of isolation of apexes on their capacity for regeneration. The buds sprouted either on the tuber or, having sprouted with part of the parenchyma (20×20 μm), before sprouting. The results of the studies revealed how important the effect of isolation time is on organogenesis of explants. Use of individual buds increased significantly the number of regenerated plants. It was demonstrated that tuber metabolites have an inhibiting effect on regenerative capacity of isolated meristems.

In vitro cultivation of isolated apexes revealed, in many plants, periodic seasonal activity in regenerated plant formation. In the potato, morphogenesis of explants is the most active when planted in February to June, after which it decreases appreciably or is absent. Nutrient media used to cultivate potato apexes differ in composition of macroelements and trace elements, as well as

vitamins. As a rule, gibberellic acid (GA), kinetin or a mixture of the two are used as growth regulators. The medium composition depends on the variety of potato, cultivation conditions, time of isolation and size of apexes.

As indicated by the obtained data, appropriate changes in composition of exogenous growth regulators in the medium are needed for organogenesis of apexes isolated at different stages of forced dormancy. The physiological state of isolated apexes depends on the amount of metabolites and endogenous growth regulators, the composition and concentration of which change with the change from profound dormancy to forced and during forced dormancy. During the dormant period, the tubers and eyes of the potato contain many growth inhibitors, in particular, abscissic acid (ABA), which is concentrated in the meristem of the eyes and tissues of skin parenchyma that surrounds them. With the end of the dormant period the amount of ABA in meristems decreases 10-100-fold. At the same time there is considerable increase in cytokinin content of tubers and eyes and increase in activity of gibberellinoid substances. As a result, both growth inhibitors and endogenous cytokinins manifest activity during the period of forced dormancy.

When the buds sprout, there is increase in cytokinin activity, free gibberellins appear and there is elevation of auxin levels. Thus, while metabolism of tubers during the period of profound dormancy is related to prevention of sprouting, during the period of forced dormancy the tubers acquire the capacity for growth. However, when isolated apexes are cultivated in vitro, regeneration depends not only on the quantity and proportion of endogenous growth regulators, but presence of exogenous regulators in the medium. The findings made it possible to demonstrate that GA was more active in organogenesis when isolation was performed in February, at the early stage of forced dormancy. With increase in duration of forced dormancy (April-June), there was decline of capacity for organogenesis on medium with GA, but an increase in a medium with kinetin. This was demonstrated in apexes of all varieties. However, organogenetic activity depended on the variety of potatoes: under the influence of GA it was higher in apexes of early maturing varieties and under the effect of kinetic, of medium-late and late ones.

Recovery of the maximum number of regenerated plants is one of the main objectives when reproducing virus-free planting material.

Propagation of potatoes with cuttings in vitro raised the reproduction coefficient to 4-7. Three-fold propagation by cuttings of test-tube plants, with a coefficient of 7, makes it possible to raise more than 300 regenerated plants per meristem.

However, plants suitable for use of cuttings can be obtained only after transplantation (sometimes more than once) of runners formed from meristem on fresh nutrient medium, since the old medium inhibits further morphogenesis.

A study was made of the feasibility and conditions for cultivating regenerated plants on liquid medium. Early and medium-late maturing potato varieties and eight variants of nutrient medium were studied. The meristem was isolated from the apical part (apical meristem), top, middle and bottom (lateral meristems). As a result it was shown that the method of cultivating explants

on liquid medium can be recommended for practical use, thereby eliminating the labor-consuming transplantation of explants on fresh medium.

The existing system of reproducing improved planting material consists of the following stages: 1) recovery of healthy potato plants by the method of meristem culture; 2) reproduction in order to obtain in vitro mericlones; 3) cultivation of mericlones in a hothouse with protection against infection. This work is rather labor-consuming, expensive and requires many highly qualified operators.

In 1978, an effective method was developed in the laboratory for production of tuber formation in vitro, which rendered the system of virus-free seed growing more technological and lowered expenses. Recovery of microtubers in test tubes made it possible to rule out the danger of reinfection at all stages of raising virus-free seeds, as well as accumulate and preserve improved sowing material for the entire autumn and winter period without additional transplantation, thus creating a sort of bank of improved valuable varieties, and permitted acceleration of the breeding process with recovery within the very first year of improved test-tube microtubers, involving simpler and cheaper production and transportation of seeds.

The work was started in 1976; test-tube potato plants of the Izobiliye variety, which matures early and Istrinskiy, which matures at a medium-late time, were used in the experiments.

Cuttings were used in March-April, taking them from the top of the test-tube plant, middle of the plant and bottom part. They were planted on a medium specially developed for tuber formation. Growth regulators that induce tuber formation were not used (since they also inhibit growth), but temperature was selected, as well as duration of dark period and composition of carbon components of the medium. The tubers obtained in test tubes (see photo [photo not reproduced]) differed in shape and size (they did not exceed 10 mm in diameter). They were kept for 3 months in test tubes, in the dark, at a temperature of 2-3°, then sprouted at 26°.

A comparative study of potato planting material, which the laboratory conducted in 1977, revealed that in both vegetation experiments in the hothouse and in small plots in open soil, the harvest raised from test-tube tubers was two or more times greater than from test-tube plants, with respect to both mass and number of tubers per bush. There was significant decrease in labor involved in starting the plants; it became possible to isolate meristem and use cuttings over a long period of time and to recover much more virus-free planting material.

More than 140 tons of virus-free potatoes were raised by the proposed method at the Gorki Leninskiye experimental farm of the institute. At the present time, the technology is being developed for planting test-tube tubers in open soil in the spring, which would radically alter the entire process of producing virus-free planting material. It was demonstrated that it is possible in principle to raise tubers outside hothouses.

Work has started in the laboratory on cellular breeding of lines resistant and tolerant to infection. These characters are inherited independently, and we are trying to make selection for both of them. The purpose of breeding for resistance is to protect the plant against infection and for tolerance, to limit the effect of infection on the plant after invasion occurs. Resistance to infection is preferable. Cellular breeding in order to recover variants of cell lines or, on their basis, whole plants, is one of the main directions of modern breeding for resistance.

In order to give highly productive cultivars resistance properties, it is desirable to cross them with wild related species. Using traditional breeding methods, these plants often fail to hybridize, or else are hybridized but do not produce viable offspring. Occasionally, there are plants that perish at early stages. However, many of these problems can be overcome by using the method of cell and tissue cultures. Pollination and fertilization in the test tube help, in a number of instances, to avoid incompatibility of partners chosen for hybridization. A culture of ovules and germs saves hybrid plants if the germ does not have enough nutrition or is not furnished with hormones on the maternal plant. Recovery of callus cells and regenerated plants from shoots that perished at early stages of development makes it possible to overcome this difficult stage also. Use of protoplasts for hybridization of somatic cells in order to insert genetic information in the cell leads to changes on the cellular level and on the level of the plant that developed from the transformed cell.

We believe that methods of cell breeding combined with mutagenesis are extremely promising for selection of plants resistant to pathogens, salts, heavy metals, extreme temperatures and herbicides. The first positive results have already been achieved in this area at the laboratory. More than 10 different varieties of potatoes have been introduced to cultivation; studies were made of the conditions that elicit plant regeneration in passaged callus tissue. Cultivars have been found and selected (Domodedovskiy, Yantarnyy and others) for further work, which have high morphogenetic activity that persists for a long time when undergoing passages. Several of the varieties, with which it is planned to perform breeding work, have been introduced in suspension cultures. At the present time, there are already hundreds of regenerated plants with broad somatic variability, which are presently being tested for resistance and other economically valuable characters.

Effective methods are being developed for cultivation of isolated protoplasts, which make it possible to regenerate plants from them; this will make it possible to breed cells on the level of isolated protoplasts, as well as to develop disease-resistant forms by means of parasexual hybridization.

The problem of virus-free potato growing is not limited to obtaining healthy planting material. In the course of reproduction, the harvest gradually diminishes due to accumulation and transmission with tubers of pathogens. This loss can be lowered if there is a system of seed growing and use of a set of preventive and protective measures.

In our country, growing virus-free potato seeds should be concentrated in specialized farms in the most beneficial zones (RSFSR, the Ukraine, Belorussia, Baltic region, Kazakhstan, as well as regions of tall mountains). It is

desirable to expand the network of farms dealing with primary seed growing, raising elite and varietal material.

Work to improve potatoes by methods of cell and tissue cultures requires the appropriate outfitting of laboratories in excess of the usual equipment and supplies, as well as highly qualified personnel. Science must solve a number of problems that would make improvement measures easier and more effective in order to make successful practical use of the new methods.

PHOTO CAPTION

Page 18. Tuber formation in test-tube potato plants.

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PATHOGENIC VIRUSES OF PLANTS STUDIED AT ALL-UNION SCIENTIFIC RESEARCH INSTITUTE OF APPLIED MOLECULAR BIOLOGY AND GENETICS

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[Article by I. G. Atabekov, chief of virology department at VNIIPMBiG (All-Union Scientific Research Institute of Applied Molecular Biology and Genetics), "Research in the Department of Virology"]

[Text] Pathogenic viruses of plants are distributed in a number of extremely important agricultural crops: potatoes, fruit, berries, grapes, sugar beets, citrus fruit, flowers, hops, legumes, etc. Potato harvest loss due to viruses, for example, may constitute 25-50% annually and, in a number of cases, 80%. It has been experimentally proven that decontamination of potatoes makes it possible to drastically increase and sometimes even double the harvest. Such work has been organized in the USSR on the basis of meristem cultures. "Meristem" laboratories are not yet able, unfortunately, to assure complete decontamination, and this subsequently leads to reinfection of healthy plants.

In order to select healthy material and preserve its virus-free state in the seed-growing process, it is necessary to provide for mass scale immunodiagnosis for the purpose of early discarding of diseased or reinfected plants.

Detection of infected plants is a paramount problem of virus-free potato seed-growing, fruit growing, viticulture and horticulture. It can be solved immediately if there are precise methods of detecting viruses and equipment for mass-scale tests when sick plants are found. At the present time, millions of analyses are performed each year at our seed-growing farms, but to have a well set-up situation, one should test hundreds of millions of potato, fruit, berry, flower and industrial crops, grapes, hops, etc., for infection with different viruses.

The problem of ridding plants of viruses is related to the fact that it is atypical of agriculture, for it can be solved only with methods and scientific psychology taken, it would seem, from areas that are far removed from plant growing--molecular virology, immunology, gene and cell engineering. For expressly this reason development of a modern system of viral immunodiagnostics in our country has been assigned to a number of scientific departments working in the area of molecular biology: VNIIPMBiG, VASKhNIL [All-Union Academy of Agricultural Sciences imeni Lenin], department of virology at MGU [Moscow State University], Institute of Molecular Biology and Institute of

Microbiology, USSR Academy of Sciences, and others. Research on improvement of potatoes is being pursued together with the Scientific Research Institute of Potato Growing and several farms.

The first task here is to develop methods of isolating viruses in pure form. This is not a simple task, since the virus content of a diseased plant not infrequently constitutes fractions of a milligram per kilogram leaves, whereas to obtain diagnostic antisera hundreds of milligrams and even grams of each virus are needed. Development of simple and accessible methods of purification of viruses takes up much time, sometimes years, depending on the "difficulty" of the object. The procedure of isolating some highly pathogenic viruses is often very complicated and requires expensive equipment and reagents.

The methods in current use for mass-scale detection of viruses have several flaws. The main one is that one can detect the virus only when it accumulates in a plant in a rather high concentration, so that the plant serves as a source of infection from the moment it is infected to the time that the virus is found.

The advances in molecular biology and immunochemistry have enabled the institute to develop very highly sensitive methods of detecting viruses: they can detect one billionth of a gram of virus in a specimen. This permits demonstration of a diseased plant at the first earliest stages of disease, to do so for potatoes, for example, on tuber material in the fall and winter, and within a very short time. Such detection is based on use of different methods of immuno-enzymatic analysis (IEA). At the present time, such analysis is used at the VNIIPMBiG to identify about 15 different viruses.

Much work is also being done to introduce IEA to practice. At the present time, these methods are used at the Scientific Research Institute of Potato Growing, which was the first in our country to produce diagnostic kits (on the basis of IEA) for potato viruses.

In the virology department of the institute, in addition to applied investigations, research is being pursued in the area of basic virology. For example, studies are being made of the phenomenon of systemic spread--transport of virus over an infected plant. When a leaf is infected, the virus reaches isolated cells, in which it must multiply (primarily infected cells) and then be transported to adjacent, healthy ones.

It was found that the virus itself is responsible for the process of transport of infection: the function of transferring infection from infected to healthy cells is coded in viral RNA, it has a transport gene. This gene can be "turned off," and then transport becomes impossible and the virus is blocked in just a few cells, while the plant remains healthy.

The staff of VNIIPMBiG and MGU demonstrated that viral genetic material is transported through the plant as part of special, previously unknown ribo-nucleoprotein particles, which play the role of transport form of virus. A comprehensive study was made of the structure of these particles that do not resemble viral particles.

Investigation of molecular mechanisms of transport of viral infection made it possible to comprehend the causes of resistance and susceptibility of a number of agricultural plants. There are serious grounds to believe that the phenomenon of viral transport is directly related to the phenomenon of induction of anti-viral state (phenomenon of so-called acquired resistance).

A significant place is devoted in the work of the department of virology to investigation of structure and expression of the genome of several potato viruses (X virus, M virus, S virus). The proteins coded by these viruses have been described by using an acellular system of protein synthesis that programs the RNA of X, M and S viruses of potatoes.

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CONTRIBUTION OF ENTOMOLOGISTS TO USSR FOOD PROGRAM

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[Text] The 9th Congress of the All-Union Entomological Society convened in Kiev from 2 to 5 October of this year. It summed up the achievements of the society in 1979-1984, outlined the basic directions of future investigations and concrete tasks in the light of the requirements of the nation's Food Program. The VEO [All-Union Entomological Society] has more than 3500 members and 22 departments. About 1000 papers were delivered at the congress. There were six working sections: general entomology, agricultural entomology, physiology, biochemistry, biophysics of insects, forest entomology, medical entomology and acarology.

"Entomologists for the Food Program" was the slogan of the 9th Congress of the VEO. In the papers and speeches of delegates and guests of the congress, attention was devoted mainly to questions of protecting agricultural crops against pest insects, integrated control of pests and development of the biological method. The research done in this direction will be instrumental in reducing the use of insecticides, expanding use of agrotechnological, biological and genetic-breeding methods of controlling plant pests and animal parasites, refining integrated systems and solving problems of environmental protection.

Questions of theoretical entomology were discussed at the congress--evolution, morphology of insects and mites, ethology, physiology, biochemistry of insects, protection of scarce and endangered species. There was comprehensive discussion of the role of insects in modern biocenoses and agrocenoses; data were submitted from studies of biocenological links of insects, development of measures to protect the gene pool of useful and endangered species.

The opening remarks were delivered by Academician M. S. Gilyarov, president of the VEO and member of the Presidium of the USSR Academy of Sciences. F. S. Babichev, vice-president of the Ukrainian Academy of Sciences, welcomed the delegates and guests at the congress.

The following individuals delivered papers at plenary sessions: M. S. Gilyarov, "The USSR Food Program and Tasks for Entomologists"; V. P. Vasil'yev, "Role of Measures to Protect Plants Against Pest Insects to Agricultural Production in Ukrainian SSR"; A. P. Markevich, "Entomoparasitology, Its Subjects and Tasks for Implementation of the USSR Food Program"; O. L. Kryzhanovskiy, "Tasks and

Future Work in the Field of Systematics and Faunistics of Insects in the USSR"; A. S. Isayev, "Forest Entomological Monitoring of Taiga Ecosystems"; V. B. Chernyshev, "Circadian Rhythms of Insect Activity and Applied Entomology"; V. I. Tobias, "All-Union Entomological Society for 125 Years," and others.

It was stressed in the paper of M. S. Gilyarov that successful implementation of the Food Program is inseparably related to improving the efficiency of agricultural production. Along with procedures that augment potential productivity (refined methods of treating soil, applying fertilizers, introduction of more productive varieties), an important part is played by measures aimed at eradication of loss of agricultural production.

The country's entomologists are faced with the following task: to reduce to the maximum extent the number of harmful insects, minimize their negative role by means of proper selection of varieties, use of sophisticated agrotechnology and system of fertilizers, with which the most vulnerable phenological phases of cultivated plants are referable to periods of low number or low activity of insect pests.

M. S. Gilyarov commented on the special importance of refinement of special measures and systems of measures, with which the insecticides used will have the least adverse effect on useful entomofauna and the environment. The main route toward solving these problems is to reduce the volume of chemical treatments, using them only at sites of pest reproduction within the shortest period of time, develop agents with selective action, including biologically active compounds. The role of biological methods must also be enlarged.

Studies must be expanded in the area of control of insects and mites in granaries. Activation of control of bloodsucking insects will help augment meat and dairy productivity of animals. Entomologists must participate in solving problems of decontaminating organic agricultural waste, as well as measures related to development of pisciculture--development of methods of breeding insects as feed for fish.

In conclusion, M. S. Gilyarov stressed that, having actively joined in solving the pressing problems put forth in the Food Program, entomologists must have broader contact with institutions that are searching for new insecticides, breeders who are working on development of new cultivars, agronomic groups developing new systems of soil cultivation, crop rotations and livestock farmers.

The paper of V. P. Vasil'yev dealt in detail with the role of measures to protect plants against pests on the example of the Ukrainian SSR. Estimates have shown that, at the present time, loss of 7% wheat grain, 12% sugar beets and 28% fruit is being averted. Intensification of pest control is a substantial reserve for further increase in agricultural output. Even reduction to only one-half of the harvest losses still existing in agriculture would yield additional thousands of tons of wheat and sugar beets. If the yield of orchards is augmented by only 6 q/ha by improved protection against pests, one could gather an additional 152,000 tons of fruit.

Entomoparasitology is the science dealing with parasitic insects and parasites of insects, which investigates individual parasite specimens, their populations and biological communities. "In the course of evolution," observed A. P. Markevich in his paper, "the ancestors of many families of insects referable to four orders (Mallophage, Anoplura, Strepsiptera, Siphonaptera) changed to parasitism. They have both a direct and indirect effect on their hosts. One can determine the objective role of entomoparasites in host pathology only by submitting them to combined investigation together with other members of eco-parasitic systems. The first and foremost task for entomoparasitology is to become associated with parasitocenology, which deals with the patterns of formation, function and evolution of parasitic ecosystems. Having joined in the combined development of problems of parasitocenology, entomoparasitology will be on the road toward obtaining more adequate theoretical data and thereby will achieve more results in practical control of agricultural pests."

In a small survey of the performance of the regular congress of VEO it is difficult to cover, even in general, the papers and reports delivered at the section meetings and symposiums. The editorial board plans to publish the most interesting material, from the standpoint of theory and practice of plant protection, submitted at the congress. We shall discuss below only a small part of the scientific developments of importance to lowering loss of harvests.

The Kazakh Scientific Research Institute of Plant Protection, for example, investigated the effect of the soil-protecting system of agriculture on entomofauna of grain crop fields in North Kazakhstan. It was noted that subsurface soil cultivation creates favorable conditions for reproduction of the grain moth, Hessian fly, fritfly, wheat bugs and other pests, with reduction in number of Opatrum sabulosum and black cellar beetles and increase in population of small cellar beetle; there is virtually no change in number of Hymenoptera. When wheat is sown in the second half of May there is drastic reduction in number of new generation grain moths, stem-invading ["skrytostebel'nyye?] pests, striped wheat flea beetle (to 1/5th-1/7th), as well as wheat thrips, but increase in negative role of grain aphids.

The Altay Scientific Research Institute of Agriculture and Agricultural Crop Breeding established that with subsurface cultivation in a grain field, the number of predacious ground beetles increased by 3.5 times, as compared to terracing. There was an increase in number of egg parasites, tachina flies, ladybugs and green lacewings (from 0.2 to 7.2%). Improvement of structure of planted areas, change to crop rotation with short rotation have lowered to 1/2-1/3d the population of harmful entomofauna.

The Omsk Agricultural Institute investigated the effect of fall soil cultivation, crop rotation and the herbicide, 2,4-D, on number of wireworms. When the soil is plowed to a depth of 20-22 cm there were 1.8 times fewer pests than in the variant with subsurface cultivation and 2.3 times less than in the control (without treatment). Maximum number of wireworms was observed on corn fields and minimum on fallow. The 2,4-D herbicide had an insignificant effect on these pests.

At the Odessa Experimental Agricultural Station, studies were made of the effect of cultivation and fertilizers on winter wheat pests. Thus, superficial

cultivation at the optimum sowing time reduced by 30-40% the number of chinch bugs and cereal flies, but increased by 2-2.5 times the number of wheat-stem sawflies and cereal leaf beetles. Large doses of fertilizer applied below the basic cultivation level ($N_{120-180}P_{90}K_{60}$) reduced by 15-40% the number of chinch bugs and cereal flies and by 30-50%, beetles and sawflies. Nitrogen (40, 60 and 80 kg active substance/ha) applied under basic cultivation level had virtually no effect on the number of pests. However, a nutritional supplement (N_{60} or N_{30+30}) against this background not only reduced the number of pests, but increased gluten content of grain. Up to 5 q/ha were spared from losses. It was observed that urea or ammonium nitrate supplement (30 kg nitrogen active substance/ha) outside the roots was toxic for the chinch bug, thrips, wheat aphids and inhibited by 10-30% development of root rot.

At the Ukrainian Scientific Research Institute of Plant Growing, Breeding and Genetics, a study was made of the role of agrotechnology in protecting winter wheat seedlings against pests that invade the stalk. More were observed when sowing was repeated. Application of a complete mineral fertilizer (120-150 and 420-450 NPK) did not affect infestation of plantations. When cultivating with a plow and using subsurface cultivation, invasion by cereal flies constituted 6.2-18.5, 8.4 and 40.1% of the stalks, and by the grain sawfly 3.8 and 4.7% in 1982 and 1983, respectively. It was proven that pre-sowing seed treatment with mixtures of pesticides is very effective. Good results were obtained by planting winter crops after stubble precursors in the first half of the optimum time.

The investigations conducted by the Krasnodar Affiliate of the State Scientific Research Institute of Civil Aviation and the All-Union Institute of Plant Protection in North Kazakhstan revealed that small-dose and ultrasmall-dose airborne spraying is highly effective in the control of the rustic shoulder-knot moth. A decrease in use of working fluid from 50 to 25 ℓ/ha did not diminish the efficacy of pest control (87-88%), but productivity of aircraft increased by 33.6%, which made it possible to reduce the cost of treatment by 25.5%. The economic effect was 0.64 rubles/ha. Tests conducted in Kustanay Oblast revealed that the domestic agent, ricifon, used at the rate of 3 ℓ/ha, was very effective against caterpillars of the rustic shoulder-knot moth. This agent does not have to be diluted in water. Efficacy of treatment is 87%. Aircraft productivity increased by 1.5 times, whereas the return on cost of protecting wheat increased by 1.9 times.

The Ukrainian Scientific Research Institute of Plant Protection developed bioeconomic guidelines for wise use of insecticides against winter wheat pests--chinch bug, thrips, aphids, leaf borers and cereal leaf beetle. Its basic elements are economic thresholds of damage, coordination of chemical treatment with phases of plant development taking into consideration preservation of entomophages, differentiated doses of insecticides, marginal or local treatment, combining treatment against a set of pests, a validated assortment of agents with consideration of their toxic properties, etc.

The Crimean Sel'khozkhimia [Agrochemical Services to Agriculture] Association is introducing on a wide scale integrated protection of grain crops against pests. In this system, agrotechnological procedures are prominent, which involve different methods of cultivation, application of ammonia water,

breaking stubble, followed by plowing, irrigation, weed control, crop rotation, selection of resistant cultivars and high-grade seeds. As for extermination measures, Trichogramma and microbiological preparations are used primarily. Insecticides are used mainly in sites of reproduction of harmful species, with consideration given to economic thresholds.

Protection of winter wheat seedlings in the eastern part of the republic is one of the areas of work of the Ukrainian Scientific Research Institute of Plant Growing, Breeding and Genetics. When winter wheat is rotated with grain precursors, presowing treatment of seeds with combined compounds containing gamma-isomer GKhTsG [hexachlorocyclohexane] and Bi-58 against a set of pests was found to be highly effective. There was decline to 1/4th-1/11th in damage to seedlings by the cereal leaf beetle and wireworms when seeds were treated with phenthiuram and Bi-58 (2+2 kg/ton), and there was concurrent 19% increase in efficacy of mineral nutrition. Studies revealed that if combined agents with Bi-58 are used for presowing seed treatment, there is significant increase in winter wheat harvest in the steppe and forest-steppe zone.

Interesting studies were conducted at VNIIF [All-Union Scientific Research Institute of Phytopathology] concerning development of insecticide resistance in aphids. Thus, legume and cucurbit aphids did not acquire high resistance when treated with insecticides for more than 170 generations. Nursery aphids developed resistant forms in 12-15 generations of treatment with actellic and carbofos (200-fold level). At the same time, use of ethaphos for 90 generations did not elicit development of resistance. Studies were made of dynamics of development of resistance to synthetic pyrethroids.

Nursery aphids, for example, acquired 100-200-fold resistance, within the period of development of 22-25 generations, to decis, ripcord and sumicidin, and 400-fold, to ambush.

The Institute of Zoology and Parasitology of the Uzbek Academy of Sciences demonstrated significant differences in resistance of wild species and cultivars of cotton plants to sucking pests. Cultivars S-1973, S-4769 and S-9029 were found to be the most resistant to aphids and spider mites. A promising strain was isolated, from which Oktyabr' 60 variety was obtained, which is resistant to sucking pests. This is attributable to its analytical structure, increasing leaf pubescence from bottom to top, consolidation of mesophyll tissues.

The biological activity of juvenoids for cotton-plant pests was evaluated at the Institute of Zoology and Parasitology, Uzbek Academy of Sciences, and Institute of Chemistry, Estonian Academy of Sciences. As a result of their effects, multiple morphogenetic anomalies were demonstrated: appearance of intermediate caterpillar-pupa specimens, differentiated pupae, caterpillars of an additional age, etc. There was inhibition of rate of development of caterpillars, extension of interecdysial period, pupation and rate of imago hatching. The demonstrated anomalies and disturbances of metamorphosis caused death of the pests. It was found that the cotton and alfalfa aphids and spider mite were susceptible to juvenoids. There was 50-95% reduction in number of pests, and decrease in number of eggs deposited by the spider mite. Best results were obtained with the juvenoid, NR 300-00.

Studies of physiologically active compounds for protection of peas against pests were pursued at the Uman Agriculture Institute. Before sowing, seeds were treated with trace elements, gibberellin, hydroquinone and Bi-58. Various combinations of agents were also used. Under the effect of physiologically active agents, there was increase in plant resistance to pests, in chlorophyll content of leaves, vitamin C, activity of peroxidase (and in damaged leaves, polyphenol oxidase and peroxidase) and amount of amino acids. The changes in proportion of basic constituents of feed had an adverse effect on pest population size and development. An additional 6-13 q/ha harvest was recovered, as compared to the control.

At the Samarkand Agricultural Institute, studies were made of methods of protecting plants using useful entomofauna of cotton fields. To preserve it, it is necessary to use a system of special measures that includes use of pesticides in the first half of the vegetation period (initial stage of cotton pest invasion) and, if necessary, in the fall, in order to reduce the hibernating element. Criteria were offered to the industry for proportion of useful and harmful species: 1:12 for spider mites, 1:22 for aphids; threshold number of spider mites 170-180/100 leaves of involved plants and up to 40 aphids per plant. The joint studies of the Samarkand Agricultural Institute and Oblast Experimental Cotton-Growing Station demonstrated that, with unilateral increase in doses of nitrogen fertilizers from 100 to 200 kg/ha or more, there is drastic increase in number of spider mites (increase in fertility of females, viability of eggs and larvae). With increase in dosage of phosphorus to 200 kg/ha (against a background of 200 kg/ha nitrogen), there was decrease to 1/6th-1/8th in number of transient mite stages. Use of nitrogen and phosphorus in a 1:0.75 proportion caused rise in number of pests, particularly on phosphate-deficient soil.

Combined use of agents having different purposes broadens the possibilities of integrated plant protection, according to data of VIZR [All-Union Institute of Plant Protection]. Thus, mixtures of pesticides reduce not only outlay of products, but frequency of treatments; increase in number of deleterious species is retarded for a longer time, it is possible to lower the incidence of diseases and improve the condition of plants.

For several years, the staff of VIZR in Parkharskiy Rayon of Tajikistan investigated systems of alternation of insecticides, acaricides and biologicals to prevent development of resistance in a set of cotton pests. Systems have been recommended that lower resistance of the bollworm to a number of agents. Development of bollworm resistance to thiodan and pyrethroids, as well as of cotton aphid and spider mite resistance to the agents used, was not observed. All this provided conditions for intensification of beneficial activity of entomophages. Frequency of chemical treatments was reduced to 2/3-1/2.

The Ukrainian Scientific Research Institute of Plant Protection investigated granulated insecticides for protection of sugar beets cultivated by the industrial technology, when it becomes necessary to submit each plant to long-term intoxication. Systemic agents (furadan, phosphamide, temik, counter) were highly effective against a number of pests. The closer the granules are to the seeds, the greater the manifestation of phytotoxicity,

particularly in dry years; when they are 2-2.5 cm to the side of seeds the effect depends on soil moisture. The optimum distribution is 1.5-3 cm below seeds; plants acquire toxicity from the time of appearance of seedlings and they retain it for 30-50 days. All this makes it possible to eliminate 2-6 sprayings.

The All-Union Scientific Research Institute of Sugar Beets conducted extensive experiments dealing with control of soil-inhabiting pests, black bean aphids and leaf miners by means of application during sowing of granulated phosphamide and gamma isomer GKhTsG in rows. Good results were also obtained with microgranulated agents against weevils, flea beetles and tortoise beetles. Application of the agents in rows reduces by 75-90% damage to sugar beets by a set of surface pests. Field sprouting increases by 10-30%, root harvest increases by 20-30 q/ha and sugar content by 0.1-0.5%.

The staff of the Scientific Research Institute of Agriculture of the Southeast investigated problems of controlling the number of insects on alfalfa in specialized farms of the Trans-Volga Region. It was recommended to plant crops of different ages and place them in the same group on irrigated plots, cutting tops for fodder 7-10 days before mowing the second crop of seed alfalfa, leaving strips on the edges (15-20 m) where migrating pest species accumulate (3-4 days later such strips are treated with insecticides). The crops are mowed at the budding phase, and seeds will be recovered from the second crop. When migration of deleterious insects from these fields ends (after 3-4 days), the plots with the first harvest are treated. Local application of insecticides reduces outlay by 60-80%. Insecticides are not used on fodder and second-crop seed alfalfa (there, ground beetles and spiders destroy nonmigrating pests). This system of measures yields an additional 1.5-2 q/ha seeds.

At the Volgograd Agricultural Institute, studies were made of the protective role of elements in raising seed alfalfa. An appropriate seed-growing system was recommended: raising seed plots in special crop rotation (broad-row sowing, use of seeds at the rate of 4-5 kg/ha), use of nitragin, optimum dosage of fertilizers and irrigation schedules, use of 2d-3d-year crops for seed purposes, not allowing overgrowth, lodging and excessive density, harvesting at the optimum time. All this increases the number and activity of pollinating insects and plant resistance to pests, as well as raises the economic threshold (by 2-3 times) and makes it possible to eliminate use of chemicals.

Methods of enhancing the efficacy of Trichogramma were studied at the Ukrainian Scientific Research Institute of Plant Protection. Several procedures are recommended: breeding the parasite at variable temperatures, periodic induction of diapause, passages through eggs of natural hosts, food supplement for adult insects, establishment of maternal stock, as well as reservations of Trichogramma in sections adjacent to protected crops, saturation of agrocenoses with sterilized eggs of host insects. All this increases effectiveness of Trichogramma by 20-30%.

The Ukrainian Scientific Research Institute of Plant Protection and Chernovtsy Oblast Biological Laboratory tested the effectiveness of using Trichogramma for the control of the cornborer in the Carpathian region. The local form of

Trichogramma was released twice (at the rate of 50,000/ha) at the beginning and in the period of mass oviposition. Pest egg infection constituted 60-66%. Plant infection constituted 15-48%, versus 28-71% in the control. Additional harvest constituted 4.3-5.8 q/ha. There was 7.5-8.7-fold return per ruble spent on biological control.

The scientists of the Central Asian Scientific Research Institute of Plant Protection developed a system of biological protection of tomatoes against moths and the glasshouse whitefly, cabbage against leaf-boring pests. Local populations of Trichogramma are used against the turnip moth and other boring moths in the spring, at the rate of 200,000/ha divided into 60,000 + 80,000 + 60,000/ha at 5-day intervals (60-70% effectiveness). For control of the boll-worm, Trichogramma is released 3-4 times against each generation (75,000 + 150,000 + 75,000/ha). In addition, the caterpillar parasite, Habrobracon (1:10) or dendrobacillin (3-4 kg/ha) is used. Overall effectiveness constitutes 75-90%.

Good results have been obtained with the parasite, Trichaporus against the glasshouse whitefly (1:10). Each ruble spent on its use yields a 9.2-fold return (4.3-fold in open ground). The microbiological agent, dendrobacillin-3 (3 kg/ha) had a strong effect on caterpillars of cabbage white butterflies and cabbage moths. Trichogramma was used (60,000 + 80,000 + 60,000/ha) at 5-day intervals against eggs of metal-like moths. If the effect is inadequate, Habrobracon or dendrobacillin is used additionally. Overall effectiveness of biological control is 86-92%. There is a 6-7-fold return per ruble spent.

Theoretical and practical problems of biological pest control in closed ground were elaborated by the scientists of the All-Union Scientific Research Institute of Phytopathology. Determination was made of effective parasites, predators and pathogens for the most important pests of vegetable crops; methods have been proposed for their mass-scale breeding and use. Thus, biological protection of cucumbers and green crops reduced to 1/2-1/3 the number of chemical treatments and yielded harvests without traces of agents; it improved sanitary and hygienic working conditions, increased the profitability of special measures.

Work was done at the Ukrainian Agricultural Academy on integrated control of cabbage pests. Use of granulated agents preserved entomophages and soil developers, provided beneficial conditions for pests to be attacked by their enemies. The number of cabbage moths, diamond-backed moths and small white butterflies did not exceed the economic threshold. Raising nectar plants activated the beneficial activity of entomophages.

At the Leningrad Agricultural Institute, methods were developed to improve chemical treatment of vegetable crops in the northwestern part of the RSFSR Nonchernozem Zone. Marginal application of granulated organophosphorus insecticides proved to be beneficial. Volaton, actellic and pyrethroids are highly effective against large white cabbage butterflies and cabbage moths. It was suggested that the pesticides be alternated to prevent development of resistant forms.

The efficacy of mixtures of insecticides with ridomil for control of the Colorado beetle and Phytophthora infection of potatoes was studied at the

Ukrainian Scientific Research Institute of Plant Protection. Best results against young larvae were obtained with use of ridomil with decis and Ti-78 (97-100%). Mixtures of ridomil with chlorophos, volaton and phthalophos were less effective. Ridomil mixed with dursban was better than dursban alone (larval death constituted 92 and 80%, respectively). Decis alone and mixed with ridomil elicited 100% death of older larvae. Ridomil alone and mixed with insecticides lowered to 1/3d phytophthorosis of plants.

At the Kazan Agricultural Institute, BTB-202 and pyrethrum were tested against Colorado beetle larvae. A 1% suspension of product in the field elicited 62-77.4% death of larvae. BTB-202 had a simultaneous effect on larvae that had passed into soil for pupation (their mortality constituted 79.2%). Pyrethrum (1 g/bush) elicited 86% death of 2d-3d age larvae on the 3d day. Harvest increased by 24-57%, cost of production decreased to almost one-half.

The scientists of the All-Union Scientific Research Institute of Biological Methods of Plant Protection established that the Colorado beetle is susceptible to microsporidium infection. There was confirmation of experimental findings indicative of the fact that N. algerae and N. gastroidea elicit disease in larvae, pupae and adult specimens of the Colorado beetle, with lethal outcome; determination was made of dosage of pathogen for first and second-age larvae.

The Institute of Zoology and Parasitology of the Lithuanian Academy of Sciences investigated the role of shelter belts in regulating the number of orchard pests. Orchard-protecting belts of a new design (determination was made of width and number of rows, botanical composition of tree and grass species) make it possible to restore biocenotic links between deleterious and useful species, which is an important element of integrated plant protection.

The role of the biological method in integrated protection of fruit crops against pests was studied at the Novoselki Experimental Production Farm of the Ukrainian Scientific Research Institute of Horticulture. It was found that bitoxibacillin, BIP, dendrobacillin, dipel and lepidocid were effective against the rose leaf roller, winter moth and apple moth; bitoxibacillin, dipel, lepidocid and virin were effective against the codling moth (62-83% death of caterpillars, versus 85-99% with use of insecticides). The biological agents had no adverse effect on entomophages. Entomophages infected 20% of the caterpillars of the winter moth, 37% of the caterpillars and pupae of leaf borers and 90% of the miner moths where biological agents had been used.

In Krasnodar Kray, use of pheromone traps to record hatching of the codling moth was very effective (North-Caucasus Zonal Scientific Research Institute of Horticulture and Viticulture). With average population density of up to 20 specimens in the diapause per tree and three generations, the threshold of deleteriousness was 5 butterflies per trap in 5 days, considering a temperature coefficient of 30°. This facilitated detection of the pest and provided more accurate information for optimum use of insecticides. As a result, frequency of chemical treatments was reduced to 1-3. Net income was 16-43 rubles/ha.

At the Azerbaijan Scientific Research Institute of Plant Protection, work is being done on integrated methods of protecting intensive orchards. Thresholds of deleteriousness of the main species have been determined: average of 1-3 active spider mites [Bryobia redikorzevi] per leaf, 1-2 caterpillars of codling moths per 100 fruit and 1-3 San Jose scale specimens per 10 cm of year-old shoot. The system includes agrotechnological measures, chemical (Bi-58, metaphos, ambush) and biological (dendrobacillin) agents. Frequency of chemical treatments was reduced to less than one-half.

At the Khar'kov Agricultural Institute, determination has been made of the dynamics in population size and deleteriousness of the basic pests of black currants, and steps were developed to control them. The currant-borer is particularly dangerous. Primarily agrotechnological procedures have been recommended to control it. Depending on the time of pruning, 22-44% (in the fall or early spring) to 79-90% of the pests (during mass-scale flowering of currant bushes or at the end of this period) are eliminated.

At the All-Union Scientific Research Institute of Phytopathology, studies were made of some procedures in integrated control of grape spider mites. The predatory mite, Metaseiulus has been introduced and acclimated (standard release of 10,000 specimens per hectare). It was found that this pest is highly resistant to insecticides and acaricides.

Use of Metaseiulus has yielded an economic effect of 304 to 668 rubles/ha and reduced the damage of spider mites to economically imperceptible levels.

Even from this brief list of some results of investigations pursued by entomologists, it is apparent that they are important to further reduction of losses due to pests, recovery of a full harvest and environmental protection.

The 9th Congress of the All-Union Entomological Society was of great interest to the scientific community and production workers. A complex program has been outlined for scientific research on the main problems of entomology, particularly in the area of plant protection. Their solution and broad introduction of completed developments will help rural workers fulfill the tasks set forth in the Food Program.

PHOTO CAPTION

Page 23. In the presidium of the 9th VEO Congress. Academician M. S. Gilyarov, president of the society is speaking.

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CSO: 1840/1041

EDUCATIONAL FILM ON RAISING WINTER RYE

Moscow ZASHCHITA RASTENIY in Russian No 12, Dec 84
p 24

[Article by L. P. Sechina]

[Text] The Tallinfilm Motion Picture Studio released in 1983 an industrial-publicity film in color entitled "Industrial Technology for Raising Winter Rye." It acquaints viewers with the regions where this crop is farmed, the work of breeding specialists who developed highly productive varieties. The film demonstrates the knowhow of progressive farms in Korelichskiy Rayon of Grodno Oblast in Belorussian SSR. There, rye takes up 36% of the area used for grain crops, and average harvest is 26-27 q/ha.

Starting with preparations for sowing and establishment of crop rotation in the fields, the film tells about determination of optimum doses and types of fertilizers, with consideration of differences in soil and chemical tests, time for applying them and performing various agrotechnological and protective measures.

The film will be useful to administrators and specialists at farms, machine operators, students at agricultural VUZ's, tekhnikums and agricultural vocational-technical schools. It can be obtained for screening at rayon and oblast film-rental offices.

10,657
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MACHINERY FOR PLANT PROTECTION--NEWS FROM ABROAD

Moscow ZASHCHITA RASTENIY in Russian No 12, Dec 84
pp 51-52

[Article by Doctor Kh. Dyunnebayl]

[Text] About 80% of the protective measures in cooperative, national and other agricultural enterprises of the GDR are implemented by agrochemical centers. Such work is being done in part at farms where fruit, grapes and hops are raised using their own resources or with equipment taken from the agrochemical centers.

On the basis of an agreement between the GDR and HPR [Hungarian People's Republic] in 1966-1972, a joint experimental design project was performed for a system of machines (made up of standardized units and parts) for plant protection under different climate conditions.

Type S-293 mounted machines were produced at GDR Plants (to be assembled with power-driven type RS-09 bodies), as well as the S-030 for field crops and orchards, trailer sprayers, type S-041, for field crops.

Since 1973, Kertitox machines have been produced in Hungary by the Mezegep Association (in Debrecen), with 3 times the output of previously built ones; it constitutes 4-7 ha/h, and one machine can cover 4000-7000 ha per year.

The sprayer has a 1000- or 2000-ℓ tank, which is equipped with a centrifugal (to generate pressure of 0.4 mPa) or piston (4 mPa) pump. The existence of standardized units and parts makes it possible to use different versions of the machine.

At the present time, mainly trailer sprayers with a sweep of 18 m, 2000-ℓ tank and water-containing boom, as well as trailer sprayers with a sweep of 13.5 m, 1000-ℓ tank and special attachment that delivers a stream of air to the nozzles, are used in the GDR for field crops. The sweep width was so selected as to make it possible to also treat crops planted in rows.

In recent times, roads are provided at many farms in, for example, grain fields, to allow equipment to move during cultivation and apply mineral fertilizers. As shown by the results of investigations this did not reduce productivity of plants.

In that country, sprayers are also used that are installed in the body of motor vehicles. They were previously produced by agrochemical centers, but now production has been set up in Hungary. Kertitox-Global machines have a 4000-ℓ tank and sweep of 18 m. Because it is possible to alter the wheel track, it will be possible to use them also to work on plowed fields.

The agrochemical centers have started to install the main units of Kertitox machines with 2000-ℓ tanks in the body of Robur trucks. Since the load capacity of the latter is small (3 tons), the sprayers are suitable for use on potatoes.

In orchards, vineyards and hop fields, essentially the same machines are used as in field cropping, but they are equipped with piston pumps that generate high pressure and special spraying devices. These are sprayer trailers with 1000- and 2000-ℓ tanks, 2 manual spray rodes for top spraying and additional working platform, trailers with one or two rows of adjustable nozzles, trailers with axial fan for fine-mist spraying indoors.

As a rule, there are two or more machines working on one or two adjacent fields at the agrochemical centers; they are filled in the same place, which makes it possible to reduce time spent on preparing the working fluid and adhere to the required concentration. There are also permanent mixing and filling stations, where the liquid is first prepared in a high concentration by a mechanized method then diluted in water in large tanks. From there, the working fluid is delivered by high-power pumps, through pipes, to the machine, which is equipped with a mixer to maintain a uniform concentration, and transported to the field where the sprayers are filled.

In mobile mixing and filling units, a concentrate of working liquid is prepared similarly in the field. When being loaded, it is diluted in water to the desired concentration.

The above-mentioned machines have gained use not only in the GDR, but CSSR, HPR and Cuba.

Second-generation machines of the Kertitox type, which are designed to be used with 35-60 kW tractors, are undergoing state testing. Like the first-generation machines, they consist of standardized units and parts, which simplifies not only their production, but repair. The sprayers can have 1500-, 2000- or 3000-ℓ tanks, a centrifugal pump generating pressure on the order of 0.4 or 0.8 mPa or a piston pump that produces pressure of up to 4 mPa. They can be additionally equipped with electronic adjustment devices to provide a constant outlay of working fluid.

Machines of the Kertitox-Favorit type are suitable for treatment of field crops and application of liquid fertilizer. They are equipped with two centrifugal pumps installed parallel to one another or in series, they generate the required pressure and deliver a specific amount of liquid. Wheel track and sweep (12 or 18 m) can be adjusted. In moving position, the boom sections are above the tank and oriented forward; in working position they are turned hydraulically and their height is adjusted (it is planned to raise maximum height to 1.7 m). There are shock-absorbing elements in suspended boom sections, which reduce significantly vibration while moving in the field.

Kertitox-Bora machines with axial fans are designed for mist-spraying of orchards, vineyards and hop fields. Fan output is 30,000-60,000 m^3/h at pump pressure of 4 mPa. A new form of fan outlet with use of guide shutters permits uniform distribution of the agent over the plant leaf surface.

The natural wind direction is used for mist spraying with Kertitox-Tornado machines. Because of the guides on the axial fan, the product is distributed in one or several directions. Since the Kertitox-Tornado machines are equipped with an auxiliary 50 kW motor controlled from the tractor, the output of the axial fans can reach 100,000 m^3/h. One can work in orchards and vineyards with use of the axial fan from the Kertitox-Bora machine.

10,657
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MEETING OF PLANT PROTECTION SECTION OF ALL-RUSSIAN DEPARTMENT OF ALL-UNION ACADEMY OF AGRICULTURAL SCIENCES

Moscow ZASHCHITA RASTENIY in Russian No 12, Dec 84
p 56

[Article by Ye. D. Kuznetsova, chief agronomist of Sector of Agriculture, Use of Chemicals and Plant Protection, NRO (expansion unknown) of the All-Union Academy of Agricultural Sciences imeni Lenin]

[Text] In June of this year, there was a regularly scheduled meeting of the Plant Protection Section of the All-Russian Department of VASKhNIL [All-Union Agricultural Academy imeni Lenin] dealing with the distinctions of pest development in the case of irrigated farming.

The main paper was delivered by A. V. Badulin, chief of Plant Protection Department of Volgograd Agricultural Institute. He remarked that the conditions of irrigated and drained land have all the opportunities for planned control and regulation of number of both harmful and useful insects (entomophages, wild pollinators) in agrocenosis of field crops. Use of mineral fertilizers in an optimum and balanced proportion drastically increases harvest and plant resistance to pests and diseases. Adherence to sowing time and optimum standards in sowing spike-bearing grain crops prevent the danger of damage to wheat stem sawflies, barley fritflies and lowers the damage caused by chinch bugs, making it possible to recover 9 to 20 q/ha additional production without use of pesticides. All of these steps help preserve the useful entomofauna of irrigated agrocenoses which, in turn, controls the number of harmful species.

A. V. Badulin made special mention of the fact that investigation of pests must be pursued concurrently with studies of ecosystems, otherwise it is impossible to make an objective assessment of deleterious or useful activity of fauna.

A. V. Lomtev, chief of the Plant Protection Department at the All-Russian Scientific Research Institute of Irrigated Agriculture, stressed that, from the phytosanitary point of view, the optimum time for raising alfalfa on the same field is 3 years. It is recommended to treat alfalfa twice before flowering to lower the number of Phytonomus [alfalfa-leaf weevil] and Tychius mites. One should use vegetation and soaking irrigation to control the Lima-bean pod borer.

M. L. Vedeneyeva, chief of plant protection department at the Elita Povolzhya [Volga Region Elite] Scientific Production Association spoke about the work of her group on investigation of dynamics of population size and harm of grain aphids [green bugs], thrips, stem-invading wheat pests in areas of irrigated farming with use of different doses of fertilizer. As a result of these studies, it was established that the species composition of pests and diseases is identical with irrigation to the species diversity with dry farming. However, with excessive nitrogen fertilizers, the number of pests and degree of development of diseases were higher than on unirrigated land. The phytophages are less harmful on irrigated land, their activity is notably stable in different years and has equivalent parameters, which are inherent for years with average precipitation. M. L. Vedeneyeva informed the audience of the fact that economic thresholds of deleteriousness have been determined for the basic pests of seed alfalfa; the species composition was defined and determination made of significance of different pollinator species; a system of steps was offered to control the number of phytophages and pollinators of alfalfa. Unfortunately, there are problems with introduction of scientists' recommendations to agriculture due to underestimation by farm administrators of entomological and phytopathological factors.

I. V. Panarin, chief of plant protection department at the Krasnodar Scientific Research Institute of Agriculture imeni Luk'yanenko, analyzed the causes of wheat damage in the case of irrigation. He stated: "Septoria leaf spot is particularly severe, and there are still no effective enough pesticides to protect the crop. Nor are there any resistant cultivars. Higher doses of fertilizer only intensify the severity of spetoria leaf spot, root rot and cereal leaf beetle damage. In the foothill and central zones of Krasnodar Kray, up to 30% of the spikes are stricken with fusariosis, and there are no chemicals to control this disease."

A. S. Volovik, chief of plant protection department at the Scientific Research Institute of Potato Growing discussed the influence of fertilizers on development of phytophthora infection. For example, it must be borne in mind that potassium and phosphorus retard development of this disease, while nitrogen enhances it.

A. Ye. Chumakov, administrator of phytopathology department at the All-Union Institute of Plant Protection, called the attention of the conference participants on the need to work out the economic thresholds of damage caused by plant diseases, which should be based on long-term forecasts. Only then will determination of the damage, as a percentage, done by pathogens be reliable. Forecasts of development of the basic diseases of many farm crops have already been prepared at the All-Union Institute of Plant Protection.

A. N. Abdullayev, chief of plant protection department at the Dagestan Scientific Research Institute stressed that damage thresholds are particularly needed for the resort zone of North Caucasus, where the number of chemical treatments should be reduced to a minimum. The All-Union Institute of Plant Protection should expedite publication and transmission to farm specialists of methods for determination of thresholds and preparation of long-term forecasts of development of deleterious organisms.

The conference participants learned about the experience gained in plant protection at the All-Russian Scientific Research Institute with regard to agricultural use of reclaimed land, systems of protective measures for grain crops, potatoes, flax and clover on reclaimed land.

Investigations dealing with treatment of seeds of winter wheat and barley as related to their grade, as well as determination of development of root rot on the basis of the score assigned to plant damage and protection of common flax against bacteriosis, elicited particular interest.

10,657
CSO: 1840/1041

CONFERENCES OF FARM PEST FORECASTERS

Moscow ZASHCHITA RASTENIY in Russian No 12, Dec 84
pp 56-57

[Article by I. V. Gayvoronskaya, chief of Russian Laboratory of Forecasts and Diagnosis]

[Text] Seminar-conferences dealing with improvement of methods of forcecasting appearance of agricultural crop pests and diseases were held in April-May in Voronezh and Novosibirsk.

The chiefs of oblast, kray and republic-level (ASSR) laboratories of diagnosis and forecasts in the European part of the republic and centers for reporting and forecasting in Voronezh Oblast, as well as the leading scientists of VNIIZR [All-Union Scientific Research Institute of Plant Protection], VNIIF [All-Union Scientific Research Institute of Phytopathology] and NIIKKh [Scientific Research Institute of Potato Growing] assembled in Voronezh. E. B. Balayev, deputy chief of the Plant Protection Administration delivered a paper with a report on performance in 1983 and defined the tasks for the future. There was discussion at the conference of the role of the agrotechnological method in integrated plant protection, use of modern methods of forecasting appearance of pests and diseases, problems of improving the planning of work done by centers for reporting and forecasting, problems of consideration of economic thresholds of harmfulness when implementing chemical treatments, use of pheromones and light traps for determination of the habitat range of pests and optimum time for their control. The audience heard the results of introducing an automated control system to forecast phytophthora infection of potatoes, rust and other diseases.

In Novosibirsk, the conference participants consisted of forecasting specialists of the Urals, Siberia and Far East, as well as scientists from the Siberian NIIZKhIM [Scientific Research Institute of Protective Chemicals?], Biological Institute of the Siberian Department of the USSR Academy of Sciences, VNIIZR and Tomsk University.

There was discussion at the conference of questions of introducing systems for protection of agricultural crops against pests in Siberia, methodological approaches to forecasting development of infectious plant diseases; there was definition of the bases for building a system of observation of pests in

integrated protection of grain crops, as well as similar observation systems for the cereal leaf beetle, grain leafhopper, beet webworm, water vole and vegetable crop pests. The audience learned about the methods of preparing and using phytopathological maps based on analysis of many years of data on the phytosanitary situation in the republic, and they visited the laboratories of the Siberian NIIZKhIM.

The decisions adopted by the conference disclosed flaws existing in the performance of zonal and oblast, kray and republic (ASSR) laboratories. It was noted, in particular, that scientific recommendations were still not being introduced well to practice. Screenings for demonstration of such dangerous pests as the beet webworm, armyworm and Colorado beetle, as well as diseases of agricultural plants, are being performed on a low scale and they are of poor quality. Farm specialists are not sufficiently used for such screening. Observations and records are not always kept in accordance with the methodological instructions. When preparing forecasts, data covering many years are not summarized or analyzed. The economic effectiveness of special measures is not taken into consideration consistently. Standards for work, extent and cost of screening measures have still not been confirmed.

The recommendations approved by the conference defined the routes for improving forecasting methods. The attention of administrators of zonal laboratories for diagnosis and forecasting was called to the need to intensify contacts with scientific research institutions and introduce on a broader scale of scientific developments to practice, improve methodological supervision of the work done at reporting and forecasting centers.

Oblast, kray and republic (ASSR) laboratories for diagnosis and forecasting were given the assignment to implement, using kolkhoz and sovkhoz agronomists, mass-scale inspections of agricultural fields for detection of the most dangerous pests, to intensify control of their quality in accordance with existing methodological instructions, for which purpose it was decided to organize a broad corresponding network of kolkhoz and sovkhoz agronomists, brigade leaders, unit workers, amateur horticulturists and biology instructors. Work will be intensified in the area of determining the technical and economic efficiency of special measures.

10,657
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ALL-UNION CONFERENCE OF PHYTOVIROLOGISTS IN LITHUANIA

Moscow ZASHCHITA RASTENIY in Russian No 12, Dec 84
pp 57-58

[Article by L. N. Samsonova, junior scientific associate]

[Text] The 8th All-Union Conference on Viral Diseases of Plants was organized by the Institute of Botany, Lithuanian Academy of Sciences, together with the Commission for Viral Plant Diseases under VASKhNIL [All-Union Academy of Agricultural Sciences imeni Lenin], and it was held in Vilnius in May 1984. The agenda included exchange of experience in investigation and practical use of farm crop immunity to viral diseases. A total of 200 specialists participated in the conference.

Academician A. U. Merkis, director of the Institute of Botany, Lithuanian Academy of Sciences, delivered the opening remarks. The paper of Prof Yu. I. Vlasov (VIZR [All-Union Institute of Plant Protection]) described the status of research and practical developments on the problem of resistance of agricultural crops to viral diseases. The speaker noted that integrated research, which virologists are pursuing in close contact with breeders, is yielding good results in the area of breeding for immunity to diseases. As an example, he mentioned the creative contact between virologists of the Belorussian Scientific Research Institute of Plant Protection and breeders of the BelNIIKPO [Belorussian Scientific Research Institute of Potato, Fruit and Vegetable Growing], between virologists of the Institute of General Genetics, USSR Academy of Sciences, and breeders of the NIIOKh [Scientific Research Institute of Vegetable Growing]. This fruitful work resulted in development of potato hybrids by VIR [All-Union Scientific Research Institute of Plant Growing] and BelNIIKPO, potatoes that are immune to X and Y viruses, as well as tomatoes resistant to tobacco mosaic virus.

In our country, various procedures are being developed and used to increase plant resistance to viral diseases (vaccination, anitibotics, etc.). In particular, the speaker reported that the Institute of Microbiology and Virology, Ukrainian Academy of Sciences, has recommended use of the antibiotic, imanin, for practical use; VIZR, the Institute of General Genetics, USSR Academy of Sciences, and Ukrainian NIISKhMB [Scientific Research Institute of Agricultural Microbiology?] are introducing to practice a method of protective vaccination of tomatoes. At the same time, the speaker noted that there are still quite a few problems to be solved, in particular, establishment of a collection of plant virus strains.

Other papers delivered at the plenary sessions dealt with some theoretical aspects of plant insusceptibility to viruses (I. G. Atabekov, academician of VASKhNIL), breeding for resistance of potatoes (Zh. V. Blotskaya, chief of virology laboratory at the BelNIIZR [Belorussian Scientific Research Institute]), grain crops (L. N. Vedeneyeva and T. V. Kirillova, scientific associates at the Saratov Breeding Center), vegetables (N. N. Balashova, chief of department of ecological genetics, Moldavian Academy of Sciences). Z. B. Stasyavichus, Yu. P. Stanyulis and M. K. Navalinskene, senior scientific associates in the virology laboratory of the Institute of Botany, Lithuanian Academy of Sciences, analyzed the status and prospects of research on the problem of viral plant diseases in Lithuania.

The main discussion was generated at the poster sessions, which graphically illustrated the results of investigations. Much interest was displayed in the poster reports of a methodological nature pertaining to new methods of identifying viruses and recovery of antisera. Poster reports reflecting the results of developments dealing with resistance of potatoes and vegetables to viral diseases attracted particular interest; they included papers on induced plant immunity by antiviral factor and interferon-like substances.

At the concluding plenary session, the general discussion continued and an extensive decision was adopted.

A. L. Boyko, chief of the virology department at Kiev University discussed questions of phytovirologist training.

Prof Yu. I. Shneyder (NIIOKh) observed that, when developing new, highly sensitive methods of identifying viruses, it is necessary to make wise use of the entire armamentarium available to phytovirology. Yu. I. Shneyder thanked the members of the Commission for Viral Plant Diseases under the VASKhNIL (chairman Yu. I. Vlasov) for regular organization and assistance in conducting methodological seminars and conferences dealing with this problem.

Along with young scientists, the speakers at the conference also included veteran phytovirologists--Prof Yu. A. Leont'yeva, doctor of agricultural sciences, A. Ye. Protsenko, doctor of biological sciences, B. S. Gerasimov, candidate of agricultural sciences, and others.

The adopted decision indicated the need to introduce to phytovirological practice of concrete developments (methods of evaluating potato resistance to viruses, vaccination of tomatoes, and others) approved by the USSR Ministry of Agriculture, USSR Academy of Sciences and VASKhNIL; it was suggested that methodological instructions be prepared for extensive trial of measures to protect agricultural crops, activate investigation of induced plant resistance to viruses, as well as new diagnostic methods. In the period between All-Union virological conferences, it is planned to hold methodological seminars dealing with problems of sugar beet resistance to viral diseases (Frunze, 1985) and development of methods for assessing the resistance of grain crops to viruses (Saratov, 1986).

The conference participants unanimously expressed their appreciation to the organizers and specialists of the Institute of Botany, Lithuanian Academy of Sciences, and VIZR, who published a collection of summaries of papers, consisting of 153 reports, which was ready when the conference opened.

10,657
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WORK ON BIOLOGICAL METHOD IN GEORGIAN SSR

Moscow ZASHCHITA RASTENIY in Russian No 12, Dec 84
p 58

[Text] Much attention is being given in the Georgian SSR to development of the biological method. In 1983, biologicals were used in this republic on 108,000 ha. Successful use was made of the Cryptolaemus beetle against soft scales on tea and citrus trees, against mealy worms on grape vines, use of Metaseiulus against mites on fruit trees and in vineyards, Trichogramma against the cornborer and cabbage moth, etc.

However, by far not full use is being made of the opportunities for expanding application of these biologicals.

In order to further expand the use of the biological method of control of plant diseases, pests and weeds, G. D. Megeladze, chairman of the State Committee for Agricultural Production, Georgian SSR, issued an order. It stipulates the following: to expand use of biologicals on crops, the fruit of which are used in fresh form, as well as in tea-growing, citrus-growing and resort zones, in catchment areas and fisheries. It was decided to open schools at progressive laboratories and farms that are successfully adopting the biological method to teach progressive procedures, to practice the use of incentives for laboratory and farm workers who achieve good results from biological control methods. The tasks put to scientific institutions include development of the technology for reproducing the Cryptolaemus beetle on artificial media and investigation of the possibility of using the predatory Metaseiulus mite.

The Georgian Scientific Research Institute of Plant Protection was asked to prepare and publish in large printings posters, pamphlets, guides and methodological instructions for detection, keeping records of and using naturally occurring useful organisms and other questions of biological protection.

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UDC 635.465

SOIL IMMOBILIZATION OF PHOSPHATASE

Yerevan DOKLADY AKADEMII NAUK ARMYANSKOY SSR in Russian Vol 74, No 3, 1984 pp 136-139

ABRAMAN, S. A. and GALSTYAN, A. Sh., Scientific Research Institute of Soil Science and Agrochemistry, ArSSR Ministry of Agriculture

[Abstract] Immobilization of extra-cellular phosphatase by humus substances and inorganic soil colloids has received little attention. The present article reports on isolation of basic carriers during immobilization that permitted identification of humic acid, fulvic acid, unhydrolized colloids and minerals in the soil. Soils tested included leached chernozem, heavy and moderate loam, mountain meadow sod and podzolic sod, chestnut carbonate and krasnozem (red earth). These soils were mixed with humus material in columns to which an ethanolamine-acetate buffer at pH 8.0, and 0.2 ml of toluene as an antiseptic, were added. Results showed that with chernozem, chestnut and irrigated meadow chestnut soils, the phosphatase was more active in preparations of humic acid. Humic and fulvic acids from various soils showed greater phosphatase activity compared to unhydrolyzed colloids and other soil components. References 11: 8 Russian, 3 Western.
[1737-12131]

BIOCHEMISTRY

UDC 577.153

DISCOVERY AND INTRACELLULAR LOCALIZATION OF TWO POLYPHOSPHATE-PHOSPHOHYDROLASES WITH DIFFERENT SUBSTRATE SPECIFICITY IN NEUROSPORA CRASSA SLIME

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 280, No 3, Jan 85
(manuscript received 2 Aug 84) pp 763-765

TRILISENKO, L. V., VAGABOV, V. M. and KULAYEV, I. S., Institute of Biochemistry and Physiology of Microorganisms, USSR Academy of Sciences, Pushchino, Moscow Oblast

[Abstract] Previously it was believed that enzymes involved in degradation of inorganic polyphosphates included pyrophosphatase, tripolyphosphatase, metaphosphatase and related compounds. The present article reports on polyphosphatases found in N. crassa slime, which were distinguished by substrate polymer nature; the location of these enzymes in cells was also clarified. The test slime variant was unable to synthesize cell walls, so that cells were cultured on a Fogel medium with mannite as an osmotic stabilizer. The activating element was identified by a method reported in Arch. microbiol. 1979, Vol 120 pp 31.34. Low-molecular weight enzyme hydrolysis with n = 9 required no K^+ or Mg^{2+} ions, which promoted the rate of decompositions with high-molecular weight (n = 110) polyphosphatase. The activating factor had the opposite impact on the two polyphosphatase variants. References 9: 4 Russian, 5 Western.
[256-12131]

UDC 577.156.2

NOVEL AMIDATED NEURAL PHOSPHOPEPTIDE

Tbilisi SOOBSHCHENIYA AKADEMII NAUK GRUZINSKOY SSR in Russian Vol 114, No 3, Jun 84 (manuscript received 24 Jun 83) pp 613-616

VORONOVA, N. V. and KACHARAVA, D. G., Institute of Physiology imeni I. S. Beritashvili, Georgian SSR Academy of Sciences

[Abstract] Standard peptide isolation techniques, employed on a TCA-precipitated homogenate derived from rat brain tissue, resulted in the isolation of a novel amidated phosphopeptide. The nonapeptide has the following amino acid composition: gly (26.6%), ala (10.0%), ser (16.6%), thr (3.3%), glu (6.6%), asp (3.3%), arg (10.0%), his (6.6%) and pro (20.0%), and a MW of 2120 daltons. Proline serves as the N-terminus; the maximum stability of the amidated residue is shown in neutral pH, with deamidation taking place at pH 5 and above pH 12. The deamidated peptide is labile at neutral pH values, while showing maximum stability at two pH regions, pH 4 to 6 and 9 to 12. Figures 2; references 9: 5 Russian, 4 Western.
[247-12172]

BIOPHYSICS

UDC 595.34:591.524.1 (26)

EFFECT OF ELECTRIC EXCITATION STRENGTH AND DURATION ON LIGHT RADIATION PARAMETERS OF MARINE COPEPODA

Moscow ZHURNAL OBSHCHEY BIOLOGII in Russian Vol 46, No 1, Jan-Feb 85 (manuscript received 23 Nov 82) pp 102-107

[Article by P.V. Yevstigneyev, Institute of Southern Marine Biology of the UkSSR Academy of Sciences, Laboratory of Bioluminescence, Sevastopol]

[Text] Upon excitation of the marine luminescent Copepoda Pleuromamma gracilis with electrical impulses of varying duration and intensity it was revealed that the length of the bioluminescence depends primarily on the duration of the excitational current. Both the duration and the strength of the excitation affect the amplitude of the flashes. With long duration of the excitation, the current density produces the basic action. In the sphere of large current densities, the excitation time exerts the primary influence on all the light radiation parameters studied.

The nature of the relationship of the parameters of the light radiation process of marine bioluminescence to the degree of their excitation has not been precisely clarified at the present time. Nicol (Nicol, 1958) pointed out, using the example of Noctiluca miliaris, that with an increase in the current density in the impulse the amplitude of the flashes also increases. As is known, the mechanism of the occurrence of excitation in N. miliaris is explained by the "all or nothing" principle (Gitel'zon et al., 1969). In this case the relationship of the amplitude of the bioluminescence to the excitation strength in N. miliaris does not fit into the framework of the principle mentioned. Ekkert (Eckert, 1966), however, explains this phenomenon by the simultaneous origination of the action potential at several places in the cell membrane, which leads to superimposition of the flashes. There is also a conflicting opinion: for example, the light radiation mechanism in N. miliaris has no connection at all with the action potential (Hisada, 1957). V.I. Voytov (1967) notes that a relationship of the luminescence intensity to the strength and duration of the stimulus is at variance with the possibility of a trigger mechanism of bioluminescence. Using Metridia lucens as an example, Clarke et al., (1962) also showed the influence of the stimulus strength on the intensity of the luminescence.

For quantitative determination of the functional connection between the light radiation parameters and the magnitude of the accompanying excitation, we conducted an experiment on Copepoda of the genus Pleuromamma.

Materials and Methods

Mature specimens of P. gracilis were used, and excitation of their bioluminescence was produced by a lightly dosed electrical current. Series electrostimulator ISE-01 generated square impulses up to 180 V in amplitude. The duration changed according to need from 5 to 100 milliseconds. The organisms were excited in special vessels with silver electrodes (Yevstigneyev, 1983a). The recording system was produced by transducer FEU-29, fed from a high-voltage source. The anode signal was reproduced on photographic paper with the aid of a mirror-galvanometer oscillograph NO-44 and the sweep speed was 40 mm· c^{-1} . The profiles of the bioluminescent flashes obtained were processed according to the methodology proposed earlier (Bityukov, Yevstigneyev, 1982).

The experiments were carried out during the 11th voyage of NIS [scientific research ship] "Professor Vodyanitskiy" in the South Atlantic in December 1981. The material was gathered at night by means of a Dzhedi network from a depth of 150 m. Before excitation the organisms were exposed for an hour in darkness at a temperature of 22-24°C. The statistical processing was done on an electronic computer YeS-10-10 on board.

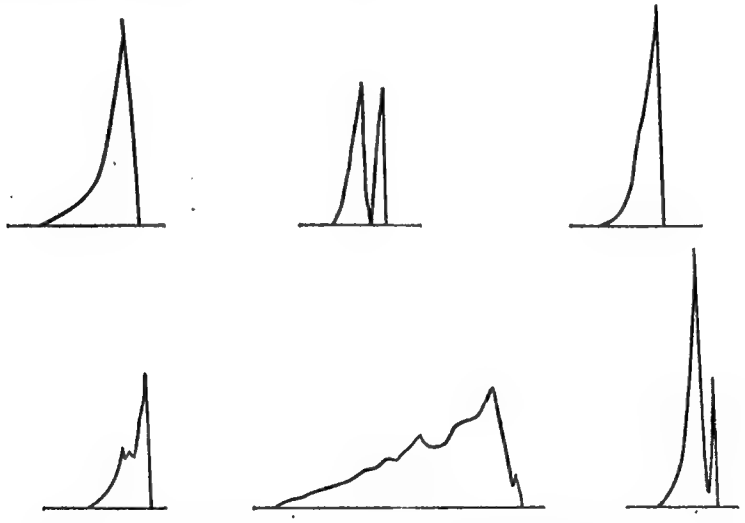

Рис. 1. Характерные биолюминесцентные сигналы копепод рода Pleuromamma

Fig. 1. Characteristic Bioluminescent Signals of Copepoda of the Genus Pleuromamma

A study of the relationship of the parameters of the bioluminescent signal of Copepoda of the Genus Pleuromamma to the duration of the electric stimulus and its strength (current density) showed that a change in the excitation parameters affects all the magnitudes examined for the profile of the bioluminescent flash of an individual organism. Figure 1 shows the most usual forms of bioluminescent flashes of Copepoda.

Table 1 gives the results of measuring the luminescence duration of Copepoda and the energy evolved during this with the action of a current impulse of varying density and duration.

Table 1

Results of a Change in Duration of Bioluminescent Flashes (L, c), and Their Energy (E, $1 \cdot 10^{-10}$ J·cm^{-3}) With the Action of a Current Impulse of Varying Density and Duration

Parameters	Duration of Impulses, mc	Current Density, mA·mm^{-2}				
		1.0	1.6	2.4	3.0	5.5
L	5	0.57	0.54	0.61	0.34	0.65
E		4.14	3.60	3.60	2.15	7.74
L	10	0.65	0.72	0.59	0.61	0.85
E		5.81	4.74	5.10	6.32	8.65
L	25	0.52	1.11	0.55	0.82	1.04
E		2.34	10.4	6.70	8.01	18.9
L	50	1.09	0.89	1.07	1.09	1.19
E		21.0	17.2	21.5	15.0	22.6
L	100	1.01	1.37	1.04	1.23	1.45
E		10.4	17.4	14.3	15.1	17.3

Note. All the magnitudes mentioned are an average from 10 measurements made

To evaluate the degree of the effect of the factors studied on the dispersion of the features studied, a two-factor dispersion analysis was made. Presented below are the results of studying the relationship of the duration of the bioluminescent flashes to the density and duration of the electrical impulses (Table 2) It can be seen from the table that the influence of both factors, as well as their combined influence on the duration of the luminescence are proven. The effect of factor B, i.e., the duration of the stimulus, is proven and great to the highest degree. The duration of the stimuli affects the dispersion of the feature most perceptibly (27%), and the combined effect of the density and duration of the current impulses is 11%. The effect of factor A, i.e., the current density, is not large. Figure 2 shows the surface of the duration values of the light flashes in P. gracilis to the action of electrical impulses of varying density and duration--with an increase in the current parameters being controlled, the duration of the bioluminescence also increases.

With the action of a current with a density of 1.5 mA·mm^{-2} and the duration of the action 1 sec., the average duration of the luminescent responses was 1.37 ± 0.4 sec., and with excitation of the organism by the same current for 5 milliseconds, the flash decreases to 0.5 ± 0.1 sec., i.e., is almost threefold shorter. The shortest responses were recorded with a current duration of 5 milliseconds, and its density 3.0 mA·mm^{-2} and was 0.3 ± 0.09 sec. on the average.

Table 2.

Results of Dispersion Analysis of the Effect of Excitation Parameters on the Bioluminescence Parameters of P. gracilis

Parameter of Flash	*A* (current strength)			*B* (duration)			*AB* (combined)		
	F exp	*F* cs	η^2	*F* exp	*F* cs	η^2	*F* exp	*F* cs	η^2
Duration	3.4	2.4	0.04	28.2	2.7	0.27	2.83	1.8	0.1
Energy	2.1	2.4	--	25.3	2.7	0.28	0.7	2.3	--
Amplitude	13.3	2.4	0.17	19.8	2.7	0.19	1.4	1.8	--

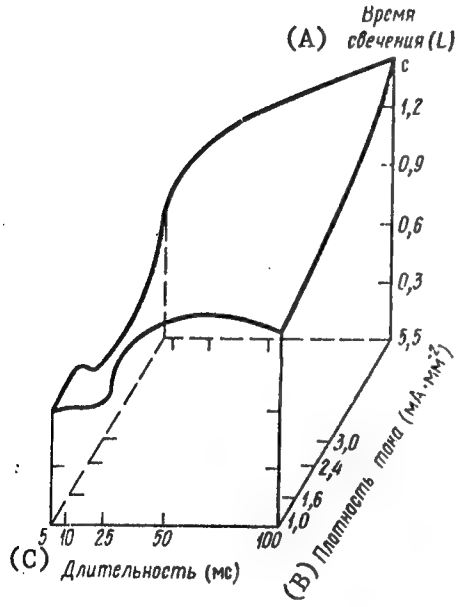

Fig. 2. Response surface of values of duration of luminescent flashes to action of electrical impulses of varying density and duration

A. Luminescence time (*L*)
B. Current density (mA•mm^{-2})
C. Duration (millisec.)

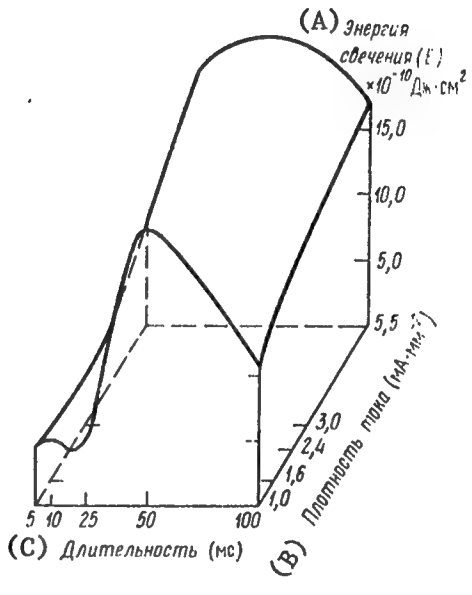

Fig. 3. Response surface of magnitudes of light energy evolved of bioluminescence in P. gracilis with action of an electrical current of varying density and duration

A. Luminescence energy (*E*) x 10^{-10} J•cm^2
B. Current density (mA•mm^{-2})
C. Duration (millisec.)

Also traced is the effect of the factors studied on the amplitude of the bioluminescent signals. It can be seen from Table 2 that the "null hypothesis" is repudiated with a high degree of certainty according to both factor A (current density) and factor B (duration). Calculation of the strength of effect of the excitation parameters mentioned on the amplitude of the light flashes shows that the duration, extracting 19% of the entire dispersion, has the greatest action, and the current strength has less of an influence (17%).

A change in the parameters of the excitation current also affects the overall energy of the light radiation. It follows from Table 2 that the "null hypothesis" is refuted with a high degree of probability only by factor B. This means that the integral energy of the bioluminescence in P. gracilis depends first of all on the duration of the excitation signal, and no current density with an essential effect on the resultative feature appears. Therefore, the interaction of the controlled factors A and B has no noticeable effect on the system's response.

The analysis made of the effect of the density and duration of electrical impulses on certain output parameters of the bioluminescent signals thus showed the dependence of the latter on the two controlled factors. A multiple regression analysis (Lisenkov, 1979) was used to reveal the structure of the interrelations of the bioluminescence parameters and also had the purpose of an analytical description of the relationship between the output parameters (time and energy) and the input (excitation time and strength). The response surfaces of the most informative indicators being studied for P. gracilis have a complex structure (Figs. 2,3), and therefore we also analyzed these three-dimensional figures in series.

The length of the luminescent flashes of the organisms studied according to the data of the analysis made depends most on the excitation duration. With small current densities in the vessel, however (1.0-1.6 $mA \cdot mm^{-2}$), exceeding by only a little the rheobase of the given species (Yevstigneyev, 1983b), no differences between the signals generated by brief electrical impulses, for example 5 and 25 milliseconds, were detected. At the same time, with more prolonged electrical activations, the difference in the bioluminescent signals was by now proven. For example, when P. gracilis was excited by a current density of 1.0 and 1.6 $mA \cdot mm^{-2}$ (X_1) with a duration of 25 and 100 milliseconds (X_2), the effect of both controlled factors was certain and can be described by an equation in the form

$$y = 0.98 + 0.28\ X_1 + 0.22\ X_2$$

where y is the duration of the flashes. It can be seen from the equation that in the given range of durations, the greatest influence on the duration of the flashes is exerted by a current strength of X_1, changing the illumination time by almost two-fold, while the excitation duration in the above limits changes the total illumination time by only 50%.

With great current densities the effect of the excitation magnitude itself is small, but the significance of the impulse duration increases. For

example, in the area of changes in the current density from 3.0 to 5.5 $mA \cdot mm^{-2}$ and a range of excitation duration from 5 to 25 milliseconds, the effect on the overall duration of the bioluminescence is brought about primarily by the time of action of the current on the object. From the equation

$$y = 0.84 + 0.26 X_2$$

it can be seen that a change in the duration of the stimulating impulse within the mentioned limits doubles the duration of the bioluminescence. The reproducibility of the experiments conducted was determined according to Kokhren's criterion ($K_\phi < K_{\tau\delta}$). The verification according to Fisher's variance ratio showed the adequacy of the expressions obtained for the experimental data.

Further analysis of the surface of response of the duration of the light radiation to excitation by a current of varying duration and density showed that, with a difference in the current densities of three-fold and over, for example, 1.0 and 3.0 $mA \cdot mm^{-2}$, and a small difference in the excitation durations (5 and 10 milliseconds, the combined action of both input parameters has a definite effect on the total time of the light radiation, on the whole somewhat reducing the luminescence time. With long durations of the excitation impulses and the same current densities, this effect on the studied response of the system is doubled.

A comparison of the free members of the equations obtained shows that the average level of the luminescence duration increases with an increase in both the duration and strength of the stimuli.

The amplitude of the bioluminescent signals is a quite variable parameter, which is also the cause of the high standard deviation and, consequently, of the dispersion. Therefore, despite the complex nature of the response surface, interpretation of the average values is impossible within the limits of small gradients of the actuating factors, in view of the uncertainty of the coefficients obtained. For example, with electrical impulse durations of 5 and 10 milliseconds, the influence of the current density on the amplitude of the flashes is certain only with a three-fold variation in the current strength--1.0 and 3.0 $mA \cdot mm^{-2}$. The corresponding expression has the form

$$y = 34.9 + 12.9 X_1$$

The same current densities in the vessel with the organism, with durations of 25 and 50 milliseconds, do not give a proven effect on the amplitude of the flashes. To register the effect of the action of the excitation duration on the amplitude of the light radiation, there must also be great differences in the time parameters of the discharge being fed. For example, within the limits of current densities of 1.0 and 1.6 $mA \cdot mm^{-2}$, the effect of the stimulus duration is recorded with a certainty $P = 0.05$ only when there is a ten-fold difference in the duration of the impulses, i.e., 5 and 50 milliseconds. The equation has the form

$$y = 48.5 + 22.9 X_2$$

It is characteristic that with great current densities, this relationship is diminished:

$$y = 66.4 + 19.0 X_2$$

As a whole, the average level of flash amplitude rises with an increase in both the duration of the action and its strength.

The energy of the bioluminescent signals is an integral characteristic, depending on the duration of the individual light radiation and its intensity. Therefore, the total energy of the flashes is affected by the abovementioned relationship of the duration and amplitude of the bioluminescence to the factors being studied, which is responsible for the complex nature of the change in total energy with the action of the electric impulses of various duration and density (Fig. 3). We shall examine the effect of the density of the excitation current on all the energy liberated with the flash. Within the limits of the changes in the factors being studied (duration of 5 to 25 milliseconds and current density from 1.0 to 2.4 $mA \cdot mm^{-2}$), the total energy is changed according to the expression

$$y = 5.3 + 2.4\ X_1 + 1.2\ X_2$$

Therefore, within the indicated limits of the factors being controlled, the current density has the greatest effect on the energy of the luminescence. It is almost twice as high as the effect exerted by the duration of the impulse. At the same time, when the temporal interval is increased to 50 milliseconds, the strength of the effect of the excitation duration increases almost in sequence, remaining, however, less than the degree of effect of the current density. Even with slight changes in the excitation duration and a large difference in current strength, the effect of the time of excitation in the range of both single milliseconds and dozens of them appears to be proven. The expressions describing this relationship take the form: $y + 5.1 + 2.4\ X_2$--for small impulse durations and $y = 18.5 + 11.4\ X_2$ --great impulse durations. Despite the difference in the coefficients of both equations, the relation of the change to the average level remains as before.

Conclusions

1. The duration of the excitation impulses has the greatest effect on the temporal parameters of bioluminescence in P. gracilis. The combined action of current density and the time of its transmission are less significant.

2. Both the duration of the electrical impulses and the density of the transmitted current affect the amplitude of the flashes.

3. The duration of the excitation impulses exerts the greatest effect on all the parameters being measured within the range of great current densities.

4. In the area of long durations of the excitation impulses, the current density exerts the basic influence on the time and amplitude of the light radiation.

5. In the area of large gradients of the value of the current being transmitted, the time of excitation exerts the primary influence on the energy, amplitude and duration of the bioluminescence.

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SEDIMENTATION ANALYSIS OF YERSINIA PSEUDOTUBERCULOSIS LIPOPOLYSACCHARIDE-PROTEIN COMPLEX

Moscow BIOFIZIKA in Russian Vol 29, No 6, Nov-Dec 84
(manuscript received 6 Dec 82; after revision, 29 Apr 83) pp 945-948

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[Abstract] Ultracentrifugation studies were conducted on a lipopolysaccharide-protein (LPSP) complex isolated from Yersinia pseudotuberculosis, in order to obtain better understanding of the physico-chemical characteristics of this macromolecule which functions as the O-antigen. The sedimentation studies demonstrated that the LPSP complex tends to associate into 26S macromolecular units, with a MW equivalent to 1.29×10^6 daltons. Treatment with EDTA or surfactants, such as sodium sarcosylate, results in the dissociation of the LPSP complexes into 70,000 dalton subunits. These observations indicate that the O-antigen of Y. pseudotuberculosis represents a nonideal, self-associating, polydisperse system, and that aggregation of LPSP complexes is dependent on hydrophobic interactions and involves the participation of bivalent metals. Figures 3; references 15: 6 Russian, 9 Western.
[259-12171]

BACTERIORHODOPSIN FLUORESCENCE AND ITS SIGNIFICANCE IN PRIMARY PHOTOPROCESSES IN PURPLE MEMBRANES AT -196°C

Moscow BIOFIZIKA in Russian Vol 29, No 6, Nov-Dec 84
(manuscript received 22 Feb 84) pp 993-997

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[Abstract] Quantitative studies were conducted on the fluorescent states of iso-bacteriorhodopsin (IBR) and pseudo-bacteriorhodopsin (PBR) formed from trans-bacteriorhodopsin (TBR), including determinations of emission and

absorption peaks and intensities at -196°C. Analysis of the data obtained for the water-glycerol suspension of light-adapted purple membranes demonstrated that the yield of PBR did not exceed 10%, while that of IBR was several fold greater. Since PBR was photoinactive and IBR active, a parallel transformation scheme was advanced for the two states, i.e., two primary reactions proceeding at different rates, yielding IBR with an excited lifetime (10 psec) ten times greater than that of TBR, and a photoinactive PBR. This concept differs from the series transformation of bacteriorhodopsin into the I form, and then into the J and finally the K forms. Figures 2; references 16: 5 Russian, 11 Western.
[259-12172]

X-RAY DIFFRACTION ANALYSIS OF NATIVE AND DENATURED BOVINE LENS

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(manuscript received 15 Dec 83) pp 1031-1035

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[Abstract] X-ray diffraction analysis of native and homogenized bovine eye lens demonstrated that maxima (Bragg spacings, 4.5-19 Å) for the nuclear and cortical regions are largely attributes of water-soluble crystallin structures. The water-crystallin structure was essentially identical in both forms of the crystalline lens. The maxima 4.5-4.6 Å are attributable to secondary beta-pleated structure of crystallin, while maxima 6.4-19.2 Å are due to tertiary and quaternary structures. On extraction, the structure of water-soluble crystallin does not suffer alterations in conformation. However, drying and dilution alter the conformation of this protein. Diffraction patterns for the water-insoluble nuclear fraction indicated that it has a more structured beta-conformation. Figures 1; references 5: 1 Russian, 4 Western.
[259-12172]

POTASSIUM CHANNELS OF FROG PHOTORECEPTOR PLASMA MEMBRANES

Moscow BIOFIZIKA in Russian Vol 29, No 5, Sep-Oct 84
(manuscript received 8 Aug 83) pp 786-789

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[Abstract] Electrophysiological studies on plasma membrane fragments of frog photoreceptor cells demonstrated uniformly distributed potassium channels, with a density of 0.5 channels/μm^2. In conditions with 0.1 M KCl on both sides of the membrane, the respective conductivities for the rods

and the cones were 72 ± 6 pS and 88 ± 8 pS. The potassium channels were reversibly blocked by tetraethylammonium, Cs^+ and Rb^+ when applied to either the internal or external surface, with 50% blockage obtained at respective concentrations of 0.12, 2.2 and 3.9 mM. Figures 2; references 6: 1 Russian, 5 Western.
[243-12172]

EFFECTIVE WATER PERMEABILITY OF MEMBRANOUS PLANT CELL STRUCTURES AT SUBZERO TEMPERATURES

Moscow BIOFIZIKA in Russian Vol 29, No 5, Sep-Oct 84
(manuscript received 11 Nov 83; in final form 20 Dec 83) pp 864-867

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[Abstract] Pulse NMR methodology was employed in an analysis of water permeability of grape-vine core cells at subzero temperatures, to compare the effectiveness and reliability of this method with other techniques relying on cell volume measurements. Water content was measured from the fall in the free induction signal amplitude, with the amplitude of the signal used to construct x(t) plots, where x = relative change in cellular volume. The latter led to the determination of the water permeability coefficient (k) at t = 0. For the core cells, k was found equal to ca. 4.9×10^{-17} $m^3/sec \cdot N$ which, in comparison with the k values for other plant cells, indicates these cells possess very low water permeability at subzero temperatures. Figures 3; references 12: 7 Russian, 5 Western.
[243-12172]

X-RAY DIFFRACTION STUDIES ON FROG CRYSTALLINE LENS

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(manuscript received 15 Dec 83) pp 873-877

KRIVANDIN, A. V., L'VOV, Yu. M., OSTROVSKIY, M. A., FEDOROVICH, I. B. and FEYGIN, L. A., Institute of Chemical Physics, USSR Academy of Sciences, Moscow; Institute of Crystallography, USSR Academy of Sciences, Moscow

[Abstract] The crystallin of Rana temporaria was subjected to x-ray diffraction analysis, in order to determine the molecular organization of the protein in the native and denatured crystalline lens. Analysis of the diffraction patterns of the lens and its nuclear and cortical components revealed a number of concentric maxima, the most intense of which corresponded to Braggs spacings of 14.6, 9.1 and 4.6 Å, attributable to crystallin structure. The intensity of the low angle scattering and the isotropic patterns indicate a lack of a definite order or orientation in the crystallin

molecule. Dehydration of the nuclear component leads to a shift in the maximum from 14.6 to 12.8 Å, demonstrating the need for hydration to maintain the native structure of the crystallin molecules. Figures 3; references 18: 4 Russian, 14 Western.
[243-12172]

PHOTOGENERATION OF SUPEROXIDE RADICALS BY OMMOCHROMES AND THEIR ROLE IN ANTIOXIDATIVE PROTECTION OF INVERTEBRATE OCULAR CELLS

Moscow BIOFIZIKA in Russian Vol 29, No 5, Sep-Oct 84
(manuscript received 29 Dec 83) pp 878-882

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[Abstract] Biochemical studies with ommochromes isolated from the eyes of Pandalus latirostris and Calopteryx splendens were found capable of generating the formation of superoxide radicals under influence of UV or visible light. Formation of the superoxide radicals was markedly accelerated by detergents (cetyltrimethylammonium bromide), and inhibited by superoxide dismutase. In addition, the ommochromes were found to inhibit lipid peroxidation initiated by Fe^{++}. It appears that the ommochromes may have a significant function in antioxidative protection of eye cells in invertebrates, since the reduced ommochromes are efficient in inhibiting lipid peroxidation. The latter reaction may be related to accelerated dismutation of the superoxide radicals. The structural similarity between phenoxazine and the ommochromes suggests that the latter may undergo reduction under light, since the reduced form promotes photogeneration of the superoxide radical. Figures 6; references 15: 2 Russian, 13 Western.
[243-12172]

SIMULATION MODELS OF REGIONAL DEPOSITION OF AEROSOL IONS IN HUMAN LUNGS

Moscow BIOFIZIKA in Russian Vol 29, No 5, Sep-Oct 84
(manuscript received 5 Dec 83) pp 883-885

PORTNOV, F. G., FAL'KENSHTEYN, S. Ye. and SHMIDT, A. B.

[Abstract] A geometric model [Veybel', E. R., Morphometry of Human Lungs (in Russian), Meditsina, Moscow, 1970] of human lungs was used for the simulation of aerosol ion deposition in the first 10-12 primary branches of the pulmonary tree. Mathematical analysis of the diffusion coefficients and ion concentrations demonstrated that 90% of the ions are deposited in that region, indicating that, as a rule, inhalation of such ions preculdes alveolar deposits. Figures 2; references 13: 9 Russian, 4 Western.
[243-12172]

CONFIGURATIONAL GENERATORS OF NEURONAL RHYTHMICITY

Moscow BIOFIZIKA in Russian Vol 29, No 5, Sep-Oct 84
(manuscript received 16 Nov 83) pp 899-902

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[Abstract] Mathematical analysis is presented of neuronal networks in which periodicity is predicated on interneuronal connections rather than inherent characteristics of the neurons. A configurational network is considered which exhibits oscillations with a period of n, such that $n > N$, where N is the number of neurons in the network with a total possible 2^N functional states. Description is provided of a matrix of simultaneously active synapses, which is capable of 'remembering' and reproducing several different patterns of activity. These modes of activity may be regarded as a generalization of self-generated wave processes. Figures 3; references 18: 12 Russian, 6 Western.
[243-12172]

BIOTECHNOLOGY

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BIOCHEMICAL EVALUATION OF QUALITY OF BROILERS FED HYDROGENOUS BACTERIAL BIOMASS

Moscow VOPROSY PITANIYA in Russian No 1, Jan-Feb 85
(manuscript received 16 Jul 84) pp 55-57

[Article by I. N. Trubachev, Yu. N. Okladnikov, V. A. Barashkov, G. S. Kalacheva and N. A. Tabakov, Photobiology Laboratory (head: I. I. Gitel'zon, M.D.), Siberian Department, USSR Academy of Sciences Institute of Biophysics, Krasnoyarsk. Subheadings appearing in upper case are set in italics in original. [Signed to press 16 Jul 1984.]

[Text] Hydrogenous bacteria are considered one of the promising potential sources of protein.[4] The proteins of these unicellular organisms resemble in their amino-acid composition those of animal origin.[1, 11] The great biological value of proteins of hydrogenous bacterial biomass (HBB) has been confirmed in numerous studies in mice, piglets, monkeys[10] amd rats.[2,8] For this reason it is important to clarify whether animal protein can be replaced by HBB in the diet of agricultural animals. One problem in this investigation is the determination of the quality of the production obtained.

The semi-industrial station[6] created at the Institute of Biophysics, Siberian Department of the USSR Academy of Sciences for production of HBB Alcaligenes eutrophus Z-1 makes it possible to resolve the stated problems.

BIOCHEMICAL COMPOSITION OF MEAT FROM BROILERS FED HBB.

The study was carried out jointly by the Institute of Biophysics, Siberian Department, USSR Academy of Sciences and the Krasnoyarsk Agricultural Institute at the Berezovka broiler factory in Krasnoyarsk Kray. The study animals were 360 one-day-old chicks; they were divided into 7 groups, the difference among which consisted in the proportion in which animal protein was replaced by HBB. Group 1 was the control group. In the diet of chicks in Group 2, HBB was substituted for 5% of the animal protein; in Group 3, for 10%, in Group 4, for 25%, in Group 5, for 50% and in Group 6 for 100% of the animal protein. Animals of Group 7 received the same diet as those of the control group, but with the inclusion of HBB in such amounts that the concentration of the study product was the same as in the diet of Group 6 chicks.

In this plan, standard animal food was not excluded. The study conditions and physiological indicators have been described elsewhere.5,7

The mean body mass of chickens in all groups except Group 6 was virtually identical up to age 30 days. After that some differences were noted. The mean weight of Group 6 chickens throughout the study (56 days) was substantially below that of animals in other groups. Group 3 had the highest mean body mass.

As Table 1 shows, there was in fact little difference in any study indicators between the control group and the study groups as to meat produced. It is well known that excessive occurrence of nucleic acids leads to increased levels of uric acid in blood and urine inasmuch as it is the end product of the metabolism of derivative purines in man, anthropoid primates, birds and reptiles.9 The lack of differences in levels of uric and nucleic acids in muscle meat of the broiler chickens of the study and control groups in spite of varying occurrence of nucleic acids in the diet owing to the presence of HBB was to be demonstrated. In all cases the level in the liver of total nucleic acids exceeded that in the muscles, a finding conforming to data for all animal species given in published reports.3

No differences were found (except for the lower values of Group 6 already mentioned) in total levels of total nitrogen, lipids, carbohydrates and nucleic acids in liver tissue from chickens of different groups.

Table 1

Indicators in Muscle Meat of Mature Broiler Chickens

Group	Dry Mass, %	Proteins % in Dry Mass	Lipids % in Dry Mass	Nucleic Acids % in Dry Mass	Uric Acid, mg %	Relative Content of all Edible Parts of Carcass, % of Live Mass	Relative Occurrence of Nucleic Acids, g/day
1-я [1]	25,4	75,6	4,3	1,3	62	81,7	0,47.
2-я	24,8	76,9	3,8	1,5	52	82,7	0,54
3-я	24,6	75,6	4,8	1,3	66	79,9	0,53
4-я	25,1	75,0	6,3	1,2	65	80,9	0,61
5-я	25,0	76,2	4,5	1,3	66	80,2	0,71
6-я	24,5	78,1	4,6	1,4	75	79,9	1,04
7-я	24,0	75,0	3,6	1,2	52	78,8	1,00

1 1st, 2nd ... 7th.

Table 2

Composition of Yolk of Eggs from Laying Hens (M±m)

Group	Relative Protein (Nx6.25) % in Dry Mass	Total Lipids	Fatty Acids, % of Total												
			14:0	14:1	15:0	16:0	16:1	17:0	17:1	18:0	18:1	18:2	18:3	18:4,	20:4
I Generation [1]															
1	28,9±2,14	67,4±1,33	0,3±0,1	0,1±0,0	0,1±0,0	25,8±1,4	5,3±0,6	0,1±0,0	0,2±0,0	7,9±0,3	44,8±1,5	14,1±0,4	0,3±0,1	0,5±0,1	0,5±0,1
2	27,1±1,02	66,6±2,22	0,4±0,0	0,1±0,0	0,1±0,0	28,2±0,9	5,5±0,8	0,2±0,0	0,2±0,0	7,7±0,3	42,5±2,0	13,7±0,6	0,4±0,1	0,4±0,1	0,6±0,2
3	28,2±1,42	66,7±2,83	0,4±0,0	0,1±0,0	0,1±0,0	25,4±0,6	5,9±0,6	0,2±0,0	0,3±0,1	7,9±0,7	42,5±1,4	15,8±0,9	0,5±0,1	0,3±0,1	0,5±0,1
II поколение [2]															
1	26,4±1,65	71,0±4,80	0,3±0,0	Следы [1]	Следы	25,1±0,1	5,0±0,1	0,2±0,0	0,1±0,0	9,5±0,1	46,1±0,1	12,9±0,1	0,3±0,0	0,1±0,0	0,4±0,0
2	27,2±1,13	66,4±2,47	0,3±0,0	»	»	24,8±0,2	4,6±0,0	0,2±0,0	0,1±0,1	9,0±0,1	47,6±0,3	11,8±0,2	0,3±0,0	0,1±0,0	0,4±0,0
3	26,8±1,60	67,1±3,87	0,3±0,0	»	»	25,1±0,1	4,7±0,0	0,2±0,0	0,1±0,0	9,2±0,1	46,1±0,2	13,5±0,2	0,3±0,0	0,1±0,0	0,4±0,0
III поколение [2]															
1	28,9±1,24	63,7±1,60	0,6±0,1	0,2±0,0	0,1±0,0	24,2±0,5	6,5±0,3	0,2±0,0	0,2±0,0	9,9±0,3	42,3±0,6	14,3±0,5	0,4±0,1	0,7±0,1	0,4±0,0
2	28,6±1,52	65,7±1,41	0,6±0,1	0,2±0,0	0,1±0,0	23,6±0,5	5,7±0,3	0,3±0,1	0,3±0,1	9,9±0,2	44,6±0,8	12,9±0,3	0,6±0,1	0,7±0,1	0,5±0,1
3	28,1±1,60	64,4±1,83	0,5±0,0	0,1±0,0	0,1±0,0	23,6±0,6	5,7±0,2	0,3±0,1	0,3±0,1	9,7±0,2	44,6±0,5	13,4±0,5	0,5±0,1	0,5±0,1	0,7±0,1

1 traces 2 generation

Note: Fatty acids were determined using a "Khrom-3" chromatograph.

Blind tasting with 22 participants did not disclose any differences at all in the organoleptic characteristics of meat from animals of different groups and bouillon from it.

Thus, even complete replacement of animal protein with HBB in the diet of chicks did not cause substantial changes in the biochemical indicators of broiler production which were studied.

BIOCHEMICAL COMPOSITION OF EGGS, MUSCLE MEAT AND LIVER FROM LAYING HENS FED A DIET CONTAINING HBB

We studied 150 11-month-old hens, which were divided into 3 groups differentiated according to the degree to which animal protein was replaced by HBB in the diet. Group 1 was the control group; in the diet of Group 2 hens 10% of the animal proteins was replaced by HBB and 20% in Group 3. The study was 3.5 months in duration. At 1.5 months before the hens were killed, eggs for incubation of a second generation were collected over 7 days. Of the chicks obtained through incubation 50 were selected for the continuation of the study. When the second generation had reached the eighth month of life, part of the hens were killed as controls in order that their condition could be examined. Eggs for the incubation of the third generation were selected when the second generation had reached the ninth month of life.

Table 3

Biochemical Composition (in % of Dry Weight) of Liver and Muscle of Third-Generation Hens

Group	Liver			Muscle		
	Rel. Protein (Nx6.25)	Total Lipids	Nucleic Acids (Total)	Rel. Protein (Nx6.25)	Total Lipids	Nucleic Acids (Total)
	I поколение (2)					
1-я (1)	61,6±0,72	24,8±2,29	1,9±0,22	78,0±2,64	3,4±0,39	0,7±0,04
2-я	65,6±3,91	23,0±2,79	2,2±0,35	77,0±1,42	3,6±0,61	0,6±0,03
3-я	62,4±1,65	24,7±1,84	2,1±0,40	76,1±1,82	4,1±0,89	0,6±0,03
	II поколение					
1-я	58,4±8,49	30,7±8,54	2,6±0,41	73,7±1,90	6,8±1,06	1,1±0,09
2-я	59,3±6,04	33,7±7,60	2,6±0,41	73,1±2,21	6,5±1,50	1,0±0,08
3-я	56,0±4,93	32,4±9,37	2,6±0,52	71,5±2,68	6,7±1,16	1,0±0,05
	III поколение					
1-я	58,6±2,50	27,1±2,40	1,9±0,18	82,7±1,96	5,4±0,56	1,2±0,06
2-я	59,3±2,61	27,4±2,20	2,0±0,22	81,2±1,26	5,2±0,78	1,2±0,04
3-я	57,5±2,55	3,22±3,21	1,9±0,08	81,9±1,22	5,0±0,18	1,3±0,07

(1) 1st, 2nd, 3rd (2) generation

Chickens of different groups within a generation showed uniform egg yield. Comparison of groups from different generations disclosed a certain decrease of the indicator in the second generation owing to age differences.

Comparison of the biochemical composition and mass of eggs from different groups of hens within a generation did not show variation (Table 2). The considerable increase in the nucleic-acid content of muscle meat from hens of the second and third generations (Table 3) compared to the first generation is explained by the younger age of the hens.

Thus, the introduction of HBB into the food of laying hens in place of the animal protein in general use (fish meal and bone meal) up to 20% of the amount in the diet did not cause significant change in the hens' productivity or the quality of their production. The important result of the studies is that there was no toxicity found in the studied biomass within the bounds of the amounts used and within the period in which the animals were observed in the study.

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MIRACLE PROTEIN

Moscow TRUD in Russian 16 Feb 85 p 3

CHUDINA, M., Leningrad

[Abstract] Recently, large quantities of protein A have become available as a result of research by A. B. Zhebrun at the Leningrad Scientific Research Institute of Epidemiology and Microbiology imeni Pasteur. The significance of this achievement lies in the many medical uses to which this protein, synthesized by some staphylococcal bacteria, can be put. In addition to its many biological effects, this protein binds specifically to certain immunoglobulins, which are the factors in the blood that are responsible for some forms of immunity. By having this protein available, it is possible to determine whether a person has enough immunoglobulins, also called antibodies, for protection against an infectious disease. The current annual production of protein A at the Institute is about four grams, but since it is used in extremely small quanitites, that can be regarded as a large amount for medical purposes.
[225-12172]

ENVIRONMENT

OXYGEN ISOTOPE COMPOSITION OF DRIFTING ARCTIC ICE IN RELATION TO ACTIVATION OF PHYTOPLANKTON GROWTH AT BOUNDARY OF MELTING ICE

Moscow BIOFIZIKA in Russian Vol 29, No 5, Sep-Oct 84
(manuscript received 19 Jul 83; 4 Oct 83) pp 835-839

LOBYSHEV, V. I., MEL'NIKOV, I. A., YESIKOV, A. D. and NECHAYEV, V. V., Physics Faculty, Moscow State University imeni M. V. Lomonosov; Institute of Oceanology imeni P. P. Shirshov, USSR Academy of Sciences, Moscow; Institute of Water Problems, USSR Academy of Sciences, Moscow

[Abstract] Studies were conducted on the oxygen isotope composition, chlorophyll concentration and carotenoid levels in drifting Arctic ice at Severnyy Polyus-23 (North Pole-23) station, between October 1977 and April 78, to determine whether a relationship exists between the oxygen isotope composition and phytoplankton concentration. Plots of ^{18}O in the ice samples versus phytoplankton concentration showed a minimum phytoplankton concentration corresponding to 1.2‰ $\delta^{18}O$. Within the 3-6‰ range the concentration of phytoplankton increased, with the rate of increase being more pronounced at the lower levels of heavy oxygen. These data revealed a direct relationship remain unclear, and the relationship will have to be subjected to more detailed analysis under laboratory conditions. Figures 3; references 17: 12 Russian, 5 Western.
[245-12172]

EPIDEMIOLOGY

UDC 599.323.4:591.521

USE OF BURROWS OF RHOMBOMYS OPIMUS (RODENTIA, CRICETIDAE) AND EPIZOOTOLOGICAL SIGNIFICANCE OF UNINHABITED COLONIES IN CENTRAL ASIAN PLAGUE FOCI

Moscow ZOOLOGICHESKIY ZHURNAL in Russian Vol 63, No 12, Dec 84
(manuscript received 11 Oct 83) pp 1848-1858

BURDELOV, L. A., BURDELOV, A. S., BONDAR', Ye. P., ZUBOV, V. V.,, MASLENNIKOV, Z. P. and RUDENCHIK, N. F., Turkmen Plague Control Station, Ashkhabad

[Abstract] Little information had previously been recorded on use of burrows by various mammal populations. The present article reports on study of migration and residence in burrows in the Southern Balkhash and the Lower Karakum Desert regions. Since time and space limitations make it difficult to obtain population information, the study concentration on visits to these burrows by Rhombomys opimus along fixed itineraries. Results showed a clear distinction in visits by individual animals to northern and southern burrows. Much more frequent visits to the southern burrows reflect the migratory nature of the animals who are in constant search of fodder to survive. The spread of radioactively-tagged fleas was much greater in the southern (Lower Karakum) range than in the northern Balkhash area, indicating that the migratory life of the southern gerbils was an important factor in spreading diseases such as plague. Paradoxically, the spread was less for the numerically larger, but more stable, northern gerbil population. References: 38 (Russian).
[249-12131]

FOOD TECHNOLOGY

NEW TYPE OF BREAD

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 10 Feb 85 p 4

DMITRUK, M.

[Abstract] At the Moscow Institute of National Economy imeni G. V. Plekhanov a novel type of bread and other bakery products have been created, which involve the replacement of the some of the sugar, butter and eggs with pureed vegetables. S. Koryachkina, candidate of technical sciences, explained that the puree, prepared from carrots, sugar beets, cabbage or other vegetables is added, to a volume of 10%, and yields much more nutritious low-calorie products. In fact, the Institute of Nutrition of the USSR Academy of Medical Sciences has approved these products, and has especially recommended them for use by the aged. An added advantage of such food is that it can easily be prepared at home.
[231-12172]

LASER EFFECTS

CHLOROPHYLL PHOTOSENSITIZED LUMINESCENCE OF SINGLET OXYGEN IN POLYSTYRENE FILMS: KINETICS AND QUENCHING AFTER LASER FLASH

Moscow BIOFIZIKA in Russian Vol 29, No 6, Nov-Dec 84
(manuscript received 25 Feb 84) pp 921-922

YEGOROV, S. Yu., KRASNOVSKIY, A. A., Jr., VACEK, K. and PANCOSKA, P., Biological Faculty, Moscow State University imeni M. V. Lomonosov; Faculty of Mathematics and Physics, Charles University, Prague, Czechoslovakia

[Abstract] A model system was devised for the study of singlet oxygen generation by chlorophyll, since singlet oxygen ($^1O_2$)--formed by energy transfer to O_2 from triplet chlorophyll molecules--appears to initiate chlorophyll destruction. The model system for the study of singlet oxygen generation consisted of chlorophyll a imbedded in polystyrene film and subjected to nitrogen laser flashes, with subsequent monitoring of singlet oxygen luminescence. The model system simulated a photosynthetic apparatus in which the chlorophyll molecules are imbedded in an organic macromolecular solid-phase matrix. Measurement of the generation and quenching kinetics of singlet oxygen emission, which showed a maximum at 1270 nm, led to a calculated lifetime for $^1O_2$ of 40 $\pm$ 5 μsec. Comparison of quantum yields in the film and in aqueous acetone solution of chlorophyll a demonstrated that the singlet oxygen generating system was less efficient in the solid-phase system, with a quantum yield on the order of 20-30% of that obtained in solution. These observations indicate that the highly viscous environment of natural membranes does not hinder singlet oxygen formation, nor significantly affect its lifetime. Figures 1; references 8: 3 Russian, 5 Western.
[259-12172]

LASERS IN MANAGEMENT OF POSTINFARCTION ARRHYTHMIA

Moscow TRUD in Russian 16 Feb 85 p 3

AYDINOV, M., Tbilisi

[Abstract] A method of successful management of one of the most life-threatening complications of myocardial infarction--cardiac arrhythmia--has

been developed at the Scientific Research Institute of Experimental and Clinical Therapy of the Georgian SSR Ministry of Health by L. Marsagishvili, candidate of medical sciences. The essential approach consists of delivering weak laser pulses via fiber optics into the regions of the heart where the nodes initiating heart contraction are located. After two years of animals studies, the method has now been used with great success in 50 human cases. As noted by N. Kipshidze, academician of the USSR Academy of Medical Sciences, this represents yet another novel application of lasers in medicine, this time in cardiology.
[225-12172]

MICROBIOLOGY

REDOX POTENTIAL DYNAMICS IN E. COLI BATCH CULTURE

Moscow BIOFIZIKA in Russian Vol 29, No 5, Sep-Oct 84
(manuscript received 14 Jan 82; in final form 28 Mar 83) pp 831-834

OKTYABRSKIY, O. N., SMIRNOVA, G. V. and ZELENIN, Ye. N., Institute of Plant and Animal Ecology, Urals Science Center, USSR Academy of Sciences, Sverdlovsk

[Abstract] Correlative studies were conducted on the redox potential, pH, pO_2 and OD of E. coli K-12 and M-17 batch cultures, to substantiate the use of the redox potential as an indicator of physiological status under conditions of glucose and ammonia depletion. Stepwise changes in E_h [redox potential] of the cultures were ascertained to reflect changes in the physiologic status and alterations in surface structures of the E. coli cells under aerobic conditions, and were attributed to changes in the electrochemical potential of hydrogen ions. Changes in the redox potential appear to represent a 'starvation signal' and, hence, the effects of environmental factors on the bacterial cells. Figures 2; references 9: 4 Russian, 5 Western.
[243-12172]

SPECTROTURBIDIMETRIC STUDIES ON BACTERIAL AGGLUTINATION

Moscow BIOFIZIKA in Russian Vol 29, No 5, Sep-Oct 84
(manuscript received 14 May 83; in final form 1 Aug 83) pp 857-861

ZHULIN, I. B., PANASENKO, V. I., STUPNIKOVA, S. K. and SHCHEGOLEV, S. Yu., Institute of Plant and Microbial Biochemistry and Physiology, USSR Academy of Sciences, Saratov; Saratov State University

[Abstract] Spectroturbidimetric studies were conducted on the agglutination of Staphylococcus aureus 209-p and Micrococcus lysodeikticus BKMB 109 by concanavalin A. The bacterial suspensions were analyzed at five wavelengths in the visible and near infrared part of the spectrum (400-600 nm) in terms of the average size of the bacterial aggregates, the number (N) of such aggregates per unit volume, and concentration of dry cell biomass (C). Mathematical evaluation of the data demonstrated that the parameter C serves

as an accurate indicator of enhanced sedimentation of bacteria as a result of aggregation due to concanavalin A, but that a change in turbidity of the suspension at a given wavelength cannot provide such information. When the sedimentation factor is excluded, agglutination can be monitored by a decrease in N and an increase in the mean effective number of cells per aggregate. Figures 3; references 25: 19 Russian, 6 Western.
[243-12172]

MILITARY MEDICINE

MILITARY MEDICAL TRAINING BOOK REVIEWED

Moscow KRASNAYA ZVEZDA in Russian 3 Feb 85 p 4

[A review by R. Marasanov, major general of the medical service, of the book: "Military-Medical Training", edited by Academician of the USSR Academy of Medical Sciences F. I. Komarov, Izdatel'stvo "Meditsina", 1984, 448 pages; the review appears under the rubric: "Guarding the Health of Soldiers"]

[Text] In May 1943, when awarding the Order of Lenin and the "Hammer and Sickle" medal to the Hero of Socialist Labor, Chief Surgeon of the Soviet Army, Lieutenant General of Medical Service N. Burdenko, the Chairman of the USSR Supreme Soviet Presidium M. I. Kalinin pointed out that the medical service of the military forces is on the level of the aviation and artillery services, and the medical workers in the army ranks are just as essential as the officers and men. During the years of the Great Fatherland War, Soviet military medicine achieved exceptionally high results: for every 100 wounded persons 70 were returned to action, and for every 100 sick persons over 90 were returned. These data are cited in the book "Voyenno-meditsinskaya podgotovka" [Military-Medical Training] edited by Academician of the USSR Academy of Medical Sciences F. Komarov and published by "Meditsina".

The book briefly outlines the history of Soviet military medicine and elucidates the problems and organization of the Soviet Army Medical Service. A special chapter is devoted to the organization of medical evacuation measures in the military forces.

In the book, the military medical service is said to be an important part of the Armed Forces. The medical staff makes a substantial contribution to safeguarding the fighting power and high fighting efficiency of the Armed Forces by preserving and strengthening the health of the army and navy personnel and doing everything possible to maintain the continous fighting efficiency of the men. The importance of the military medical service has increased particularly at this time with the significantly greater power of regular arms and means of mass destruction. This is why not only military physicians,but students who will be future reserve physicians as well, should fully understand the special features of

military medical service work and should know how to correctly implement medical evacuation, antiepidemic, and sanitary-hygiene measures in the military forces.

The authors have described in detail the range of measures that are directed at preventing the incidence of infectious diseases in the military forces and the fastest ways of eliminating them if they should appear. The reader will also find essential information on the organization of military medical supplies, a description of the basic groups of medical property, and the order of its use. Naturally, the organization and order of work of a medical service regiment and medical provisions for different types of combat are described in greater detail. It is stressed that the most important thing in medical service is finding the wounded in time, giving them medical assistance and evacuating them from the battlefield. The success of all subsequent medical staff work depends on how well the initial measures were carried out; this work involves saving the wounded, treating them, and returning them to action. It is for this reason, namely, that the book describes in detail the work methods of the medical personnel on the battlefield--collecting the wounded, giving them first aid, and removing them from the battlefield. In a special chapter, the work of an individual medical battalion is examined, and the structure and order of activity of the battalion's subdivisions are defined. Important information is presented in the book on the work of other medical units and institutions, acting independently or on the staff of hospital bases (separate medical detachment, various military field hospitals, sanitary-antiepidemic detachment and others). The basic forms for record and report documentation that are presented in the supplement are a good addition to the book.

The text is valuable not only for students of medical institutes. The book may also be recommended to military physicians as well as to students of military medical schools.

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CSO: 1840/224

NONIONIZING ELECTROMAGNETIC RADIATION EFFECTS

SHF-DIELECTROMETRIC STUDIES ON BIOPOLYMER HYDRATION

Moscow BIOFIZIKA in Russian Vol 29, No 6, Nov-Dec 84
(manuscript received 27 Dec 83) pp 935-939

SHCHEGOLEVA, T. Yu., Institute of Radiophysics and Electronics,
Ukrainian SSR Academy of Sciences, Kharkov

[Abstract] SHF-dielectrometric studies were conducted on the state of water in association with a variety of globular proteins, collagen, and native and denatured Na/DNA. The studies, conducted in the microwave region at f = 38 GHz, are based on differences in the dielectric permeability of free and bound water. On the basis of this approach determinations were made of the total amount of bound water, free water, and water frozen at various symmetric and noncrystalline sites of the macromolecules. Data on the various forms of bound water are summarized in tabular form, which demonstrated, in conjunction with x-ray crystallography, that the hydration shell is predicated on the spatial configuration of the macromolecule, and that the nature of the shell is primarily determined by firmly bound water molecules. The dielectric adsorption isotherms serve as sensitive indicators of macromolecular conformation, as indicatdd by the marked differences evident in the dielectric permeability vs. water content plots of native and denatured forms of Na/DNA, and can be used for indication of the conformational status of macromolecules. Figures 1; references 10: 7 Russian, 3 Western.
[259-12172]

THERMODYNAMIC POTENTIAL, STRESS TENSOR AND SURFACE TENSION OF NONMIXING ELECTROLYTE LAYERS IN ELECTRIC FIELD

Moscow BIOFIZIKA in Russian Vol 29, No 6, Nov-Dec 84
(manuscript received 28 Oct 83) pp 969-973

AKIMOV, V. N. and KIM, V. M., 2nd Moscow Medical Institute
imeni N. I. Pirogov

[Abstract] Theoretical studies were conducted on the thermodynamic and mechanical characteristics of nonmixing electrolyte layers in an electric field, intended to provide a model system for electrolytes in boundary layers

adjacent to biological membranes. Employing considerations applying to a binary electrolyte, mathematical equations were derived for analysis of the thermodynamic potential, stress tensor and surface tension as functions of independent variables. The latter included the applied electric field, ion concentration, and electrolyte surface area. References 3 (Russian).
[259-12172]

NATURE OF g SIGNAL AT CA, 3.0 IN EPR SPECTRA OF COOLED BIOLOGICAL SPECIMENS

Moscow BIOFIZIKA in Russian Vol 29, No 6, Nov-Dec 84
(manuscript received 30 Sep 83) pp 984-988

TSAPIN, A. I., KHANGULOV, S. V., BURBAYEV, D. Sh. and BLYUMENFEL'D, L. A., Institute of Chemical Physics, USSR Academy of Sciences, Moscow

[Abstract] Exposure of bean chloroplasts to a 0.6 Tesla magnetic field on cooling from 77 to 12°K results in a characteristic EPR signal with a g factor at approximately 3.0, whose intensity and variability precluded assignment to any component of the electron transport chain. However, the intensity and line form of the signal was dependent on the orientation of the specimen relative to the magnetic field in which the specimen is cooled to 12°K. The signal was apparent only after sonication of the chloroplasts in the pr sence of cellulose. On the basis of detection of similar signals in the algae Chlorella and the blue-gree algae Anacystis, and in copper-manganese and copper-iron alloys, the signal was ascribed to microimpurities or trace inclusions in the biological materials. Increasing the temperature from 12 to 77°K results in a decrease in the g factor from 3.0 to ca. 2.0. An analogous shift occurs with manganese and iron oxalates. It would appear that such a signal in the biological samples may be due to poorly soluble salts of organic acids. Figures 3; references 7: 2 Russian, 5 Western.
[259-12172]

MAGNETIC SUSCEPTIBILITY AND MAGNETIC "CAPTURE" OF CELLS

Moscow BIOFIZIKA in Russian Vol 29, No 5, Sep-Oct 84
(manuscript received 5 Sep 83) pp 845-851

SHALYGIN, A. N., NORINA, S. B. and KONDORSKIY, Ye. I., Physics Faculty, Moscow State University imeni M. V. Lomonosov

[Abstract] Measurements were made of movement trajectories of a large number of human erythrocytes and lymphocytes in physiological buffers in the vicinity of a transversely magnetized wire. As a result, determinations of magnetic susceptibility led to the construction of histograms for both types of cells in relation to their physiological status. Erythrocytes containing 99% oxyhemoglobin, deoxyhemoglobin or methemoglobin were differentiated,

showing that this method can be used to measure the induced magnetic moment in both red cells and lymphocytes on the order of ca. 10^5 Bohr magnetons. Such histograms lend themselves to an analysis of methemoglobin concentrations in erythrocytes, and may be useful in lymphocyte identification. Figures 5; references 7: 3 Russian, 4 Western.
[243-12172]

MECHANISM OF SHF-INDUCED CHANGES IN ERYTHROCYTE ELECTROPHORETIC MOBILITY

Moscow BIOFIZIKA in Russian Vol 29, No 5, Sep-Oct 84
(manuscript received 24 Dec 82; in final form 4 Apr 83) pp 852-856

SIGAL, V. L., OSADCHIY, P. V. and GUSEV, A. N., Institute of Oncologic Problems imeni R. Ye. Kavetskiy, Ukrainian SSR Academy of Sciences, Kiev

[Abstract] Erythrocytes derived from albino rats were subjected to SHF under defined conditions, to assess the effects of such radiation on the electrophoretic mobility of these cells as a manifestation of the biological effects of microwaves. Exposure to 2.45 GHz SHF for 30 min following a temperature increase to 40°C at a power flux of 130 mW/cm^3 led to a time-related reduction in mobility. With a control value of 1.47×10^{-8} $m^2 \times V^{-1} \times sec^{-1}$, the respective electrophoretic mobilities after 5, 15 and 30 min of exposure were 1.3 x, 1.2 x and 1.2 x ($10^{-8} m^2 \times V^{-1} \times sec^{-1}$). Further analysis of the mobility patterns and ionic states suggested that changes in mobility may not be related to the zeta potential and surface charge per se, but to changes in the ionic permeability of the erythrocyte membrane. Figures 1; references 25: 21 Russian, 4 Western.
[243-12172]

PHARMACOLOGY AND TOXICOLOGY

UDC 615.339:578.245].012.6+615.339:578.245],017:615.214

SYNTHESIS AND PSYCHOTROPIC PROPERTIES OF HUMAN INTERFERON ALPHA-$_2$ [122-125] TETRAPEPTIDE

Moscow KHIMIKO-FARMATSEVTICHESKIY ZHURNAL in Russian No 1, Jan 85 (manuscript received 20 Mar 84) pp 35-39

PANSUYEVICH, O. S., CHIPENS, G. I., BAKHAREV, V. D. and PETROVA, T. A., Institute of Organic Synthesis, LatSSR Academy of Sciences, Riga

[Abstract] Human interferon-alpha-$_2$ [122-125] tetrapeptide was synthesized and its neurotrophic and psychotrophic properties were studied and described. The method of development of the conditioned relfex of avoidance of punishment in rats (180+20g) was used to study the effect of the substance on learning processes. Optimal dose for improving primary training was found to be 100 µg/kg of weight while a 20 µg dose did not change training ability significantly and a 500 µg/kg dose worsened the learning process. The substance's effect on long-term memory is significant and statistically reliable but weaker than that produced by arginine-vasopressin. Combined injection of 20 µg/kg of arginine-vasopressin and 100 µg/kg of interferon tetrapeptide was not as effective in improving long-term memory as was use of vasopressin alone. The substance provides slight protection from electric shock amnesia, with a somewhat stronger effect on retrograde amnesia than on antigrade amnesia. References 12: 5 Russian, 7 Western.
[1037-2791]

UDC 615.356:577.161.532].036.8:616.151.514

TESTING PHYTOMENADIONE ACTIVITY DURING EXPERIMENTAL HYPOCOAGULATION

Moscow KHIMIKO-FARMATSEVTICHESKIY ZHURNAL in Russian No 1, Jan 85
(manuscript received 16 May 84) pp 40-43

YENIKEYEVA, D. A., BYZOVA, V. N., SARYCHEVA, I. K., SYTNIK, G. N., SOKOLOVA, N. A. and YEVTIGNEYEVA, R. P., Moscow Medical Stomatological Institute imeni N. A. Semasko; Moscow Institute of Precision Chemical Technology imeni M. V. Lomonosov

[Abstract] Hemagglutination activity of the vitamin K preparation phytomenadione after intravenous or oral administration was compared with that of the bisulfite derivative of vitamin K, vikasol, under conditions of experimental medicinal hypocoagulation. Tests were performed on 55 rabbits of both sexes (weight 2,5-4 kg) by usual methods. Reduction of blood coagulability was caused by intravenous injection of a 5 mg/kg dose of an anticoagulant of the coumarin series. Use of 30 mg/kg oral dose of phytomenadione almost completely prevented the change of all the indicators of coagulability caused by napharin and also the increase of the prothrombin complex activity above the preinjection level of the substances (assumed to be 100 percent). Injection of 10-20 mg/kg increased the prothrombin complex activity up to a maximum of 84-90 percent and produced partial restoration of other blood coagulability indicators. A 5 mg/kg dose of vikasol did not affect the dynamics of change of coagulability indicators registered after injection of napharin. Intravenous or oral administration of phytomenadione, in contrast to vikasol, eliminated the reduction of blood coagulability caused by anticoagulants of the coumarin series. References 11: 1 Russian, 10 Western.
[1037-2791]

UDC 661.185.1:547.461.4+541.697

DEVELOPMENT OF SURFACTANTS WITH PRONOUNCED PHARMACOLOGICAL ACTIVITY

Moscow KHIMIKO-FARMATSEVTICHESKIY ZHURNAL in Russian No 1, Jan 85
(manuscript received 16 Nov 83) pp 43-46

KABACHNYY, V. I., CHERNYKH, V. P., KABACHNYY, G. I. and SOPEL'NIK, Ye. M., Khar'kov Pharmaceutical Institute; All-Union Scientific Research Institute of Chemistry and Technology of Medicinals, Khar'kov

[Abstract] Heterylamides of sulfosuccinic acids and their derivatives were produced by sulfonation on the base of biologically active derivatives of heterylmaleinamino and heterylfumaramino acids. The compounds synthesized are colorless crystalline compounds, readily soluble in water or alcohol and insoluble in acetone. Technological and pharmacological tests showed that the compounds synthesized possess hypoglycemic, anti-inflammatory and surfactant properties and low toxicity. Analysis of the relationship of the

surfactant properties of the compounds to their chemical structure was presented. References 10 (Russian).
[1037-2791]

UDC 615.281,8:547.794.3].012.1

SYNTHESIS AND ANTIVIRAL ACTIVITY OF ALKOXYCARBONYL METHOXYBENZO-2,1,3-THIADIAZOLES AND SOME OF THEIR DERIVATIVES

Moscow KHIMIKO-FARMATSEVTICHESKIY ZHURNAL in Russian No 1, Jan 85 (manuscript received 10 Mar 84) pp 46-51

BELEN'KAYA, I. A., KROKHINA, G. P., VIGNEVICH, V. E., LOZITSKIY, V. P., YASINSKAYA, O. G. and IVANOVA, V. V., Physico-Chemical Institute, UkSSR Academy of Sciences; Scientific Research Institute of Virology and Epidemiology imeni I. I. Mechnikov, UkSSR Ministry of Health, UkSSR, Odessa

[Abstract] Some alkocycarbonylmethoxybenzo-2,1,3-thiadiazoles and haloid derivatives of 4,7-dioxo-4,7-dihydrobenzo-2,1,3-thiadiazole were produced and their antiviral activity against A2/Texas influenza and A2/Leningrad influenza was studied and discussed. Experiments on chick embryos showed that 4-chloro-5-carboethoxymethoxy, benzo-2, 1,3-thiadiazole and also 5-chloro-4,7-dioxo- and 5,6-dichloro-4,7-dioxo-4,7-dihydrobenzo-2,1,3-thiadiazole possess an antiviral effect equal to that of remantadine and may be used as inhibitors of virus activity in developing chick embryos. 4-chloro-5-carboethoxymethoxy benzo 2,1,3-thiadizole was ineffective against experimental influenza infection in mice. Figures 1; references 10: 8 Russian, 2 Western.
[1037-2791]

UDC 615.281:547.451.5].012,1+615.281:547.451.5]065:612,5.052

SYNTHESIS, ANTIMICROBIC ACTIVITY AND MUTAGENIC ACTIVITY OF BETA-HYDROXYKETONES

Moscow KHIMIKO-FARMATSEVTICHESKIY ZHURNAL in Russian No 1, Jan 85 (manuscript received 6 Feb 84) pp 51-53

SAYMKULOVA, F. G., LAPKIN, I. I., PROKHOROVA, T. S., ABASHEV, G. G., DEMAKOV, V. A., GOLYASNAYA, N. V. and BATUYEVA, G. V., Perm University imeni A. M. Gorkiy, Institute of Ecology of Plants and Animals, University Scientific Center, USSR Academy of Sciences, Perm'

[Abstract] Beta-hydroxyketones (10 compounds) were synthesized by interaction of alpha-bromoisopropyl-phenylketone and aliphatic or aromatic aldehyde in the presence of zinc and their antibacterial properties and mutagenic properties were compared to evaluate the possibility of using these compounds as chemotherapeutic agents or as sterilizing and disinfecting agents. Determination of acute toxicity of the preparations on 180 mongrel

white mice after single intraperitoneal injection showed the preparations to be nontoxic. Differences in mutagenic properties and antibacterial properties of the 10 compounds were discussed. Findings concerningtthe antimicrobic mutagenic activity and toxicity of the 10 beta-hydroxyketone compounds indicated a need for further study of them in this regard. References 7: 5 Russian, 2 Western.
[1037-2791]

UDC 615.281-[547.918-593.96].07

ANTIMICROBIC ACTIVITY ON GLYCOSIDES FROM HOLOTHURIANS OF STICHOPODIDAE FAMILY

Moscow KHIMIKO-FARMATSEVTICHESKIY ZHURNAL in Russian No 1, Jan 85 (manuscript received 25 Jan 83) pp 54-56

MAL'TSEV, I. I., STEKHOVA, S. I., SHENTSOVA, Ye. B., ANISIMOV, M. M. and STONIK, V. A., Pacific Ocean Institute of Bioorganic Chemistry, Far Eastern Scientific Center, USSR Academy of Sciences, Vladivostok

[Abstract] Comparative study of some triterpine glycosides, isolated from various species of holothurians of the Stichopodidae family and their derivatives involved determination of the relationship of antimicrobic activity to the qualitative and quantitative composition of oligosaccharide component of the glycosides and to the structure of their aglyconic parts. The glycosides studied differ from one another either in specific features of the carbon chain structure with the same aglycone or in the structure of the aglycone part with the same carbon chain. All of the glycosides studied inhibited development of test-microorganisms used in the study but the activity of the compounds depended upon both the nature of the aglycone and upon the number of monosaccharide links in the carbon chain. Both quantitative and qualitative changes in the carbon chains affected antimicrobic properties of the glycosides studied, with small changes in the carbon chain noticeably affecting the antimicrobic properties of the glycosides. The antimicrobic effect of the carbon chain of the glycoside was not limited to their capacity to penetrate the cell biomembrane since changes in the carbon chain probably affect the process of formation of glycoside complexes with sterols of the membrane. References 10: 7 Russian, 3 Western.
[1037-2791]

UDC 615.384:547.962.4]014.453

RADIATION RESISTANCE OF ALBUMIN PREPARATIONS

Moscow KHIMIKO-FARMATSEVTICHESKIY ZHURNAL in Russian No 1, Jan 85
(manuscript received 13 Jan 84) pp 90-94

KUPTSOV, A. Kh., L'VOVA, G. V., SOBOLEVA, N. N., TROFIMOV, V. I. and CHKHEIDZE, I. I., Scientific Research Institute of Biological Testing of Chemical Compounds; Institute of Chemical Physics, USSR Academy of Sciences, Moscow

[Abstract] Study of feasibility of cryoirradiation sterilization of human serum albumins involved determination of radiation resistance of these preparations at room temperature and at -20°C, -56°C and -90°C at different concentrations of protein (from 20 percent to 0,25 percent) was described and discussed. Comparison of characteristics of the preparation before and after irradiation included study of the pH, viscosity and total protein and the use of electrophoresis, combination scattering and circular dichroism. Use of cryoirradiation spectra made it possible to trace formation of intermolecular aggregates and formation of conformational changes during irradiation of the albumin solutions. Use of cryoirradiation sterilization of the preparation produced no noticeable disturbance of the molecular structure of the protein nor the macroscopic characteristics of the finished preparation while making it possible to produce sterile and safe (from danger of viral infection) albumin preparations with molecular characteristics of the protein much nearer to the parameters of native proteins than those found in preparations subjected to heating. Figures 5; references 12: 5 Russian, 7 Western.
[1037-2791]

UDC 633.88:581.19:546.18+547.94

PHOSPHORUS METABOLISM AND TROPANE ALKALOID BIOSYNTHESIS IN PLANTS

Leningrad RASTITEL'NYYE RESURSY in Russian No 1, Jan 85
(manuscript received 17 Jan 84) pp 103-106

BEREZNEGOVSKAYA, L. N., Tomsk Medical Institute

[Abstract] An assessment was made of the relative significance of phosphorus metabolism in the synthesis of tropane alkaloids--clinically important as spasmolytics, analgesics, and sedatives--in beladonna (Atropa beladonna), thorn apple (Datura innoxia), and the hogbean (Hyoscyanus niger). Analysis of growth conditions and of phosphorus metabolism in these plants in relation to tropane alkaloid production demonstrated the key importance of this element. The basic reactions leading to the formation of the alkaloids involve phosphorylation resulting in the synthesis of the acetyl-acetate component of the tropane skeleton, and the activation of methionine in

methylation of the tropane heterocycle. A more indirect but equally crucial role of phosphorus lies in phosphorylation and dephosphorylation reactions involved in the control of cellular proliferation which, in turn, serves in the regulation of the levels of tropane alkaloid biosynthesis.
References 21: 19 Russian, 2 Western.
[1040-12172]

UDC 633.81:582.998:581.19:547.913

ACHILLEA COLLINA ESSENTIAL OIL AND ITS ANTIBACTERIAL ACTIVITY

Leningrad RASTITEL'NYYE RESURSY in Russian No 1, Jan 85
(manuscript received 16 Mar 84) pp 69-73

MISHUROVA, S. S., ABBASOV, R. M., MALINOVSKAYA, T. A. and MAMEDALIYEVA, F. M., Institute of Botany, Azerbaijan SSR Academy of Sciences, Baku

[Abstract] Chemical analysis was conducted on the essential oil of microfoil Achillea collina in view of the paucity of such data in the literature. GLC and other methods of analysis demonstrated that the essential oil was characterized by some 18 organic components, of which 6 monoterpenes were identified. Testing for antibacterial activity by the tube dilution and disc methods showed that the essential oil possessed bacteriostatic properties with respect to E. coli, S. aureus, Serratia marcescens, Ps. pyocyanea and the yeast C. albicans, but was without effect on Bacillus anthracoides in a concentration of 1% in alcohol. Zones of inhibition in the disc test ranged from 20 to 28 mm. The results were interpreted as indicating a weak antibacterial spectrum, with E. coli and S. marcescens identified as the most susceptible microorganisms. Figures 2; references 13: 11 Russian, 2 Western.
[1040-12172]

UDC 633.88

TIBETAN MULTICOMPONENT MEDICINAL MIXTURES. PART 2. SELECTED PLANT COMBINATIONS WITH DEFINED BIOLOGICAL ACTION SPECTRUM

Leningrad RASTITEL'NYYE RESURSY in Russian No 1, Jan 85
(manuscript received 6 Feb 84) pp 15-25

ASEYEVA, T. A., BATUYEV, B. B., KHAPKIN, I. S., FEDOTOVSKIKH, N. N. and DASHIYEV, D. B., Institute of Biology, Buryat Branch, Siberian Department, USSR Academy of Sciences, Ulan-Ude

[Abstract] An analysis of various Tibetan medicinal prescriptions shows that most call for a mixture of tinctures or extracts from 3-5 plants.

Tabulation of such data from standard Tibetan medical sources reveals the spectrum of activity of individual components and combination in relation to various disease states. In general, the mixtures are designed to exert a regulatory effect in restoring normal homeostatic balance, in many cases via renal mechanisms. The tabulated data can serve as a starting point for the design of novel combinations for a wider range of diseases, which readily lend themselves to preclinical animal trials. References 27: 22 Russian, 5 Western.
[1040-12172]

PHYSIOLOGY

UDC 616.1-057-072.7

CARDIOVASCULAR SYSTEM REACTION DURING ORTHOSTATIC TEST IN PERSONS WITH DIFFERENT WORK CAPACITIES

Moscow GIGIYENA TRUDA I PROFESSIONAL'NYYE ZABOLEVANIYA in Russian No 1, Jan 85 (manuscript received 19 Apr 83) pp 47-48

IVANOV, V. V., Institute of Labor Hygiene and Occupational Diseases, USSR Academy of Medical Sciences, Moscow

[Abstract] Prolonged reduction in physical activity during work, and free time as well, lead to marked changes in various human organs and systems. The present article reports on study of the functional state of the cardiovascular system in individuals whose general physical activity is low. The orthostatic testing involved 42 healthy females 20-29 years of age, divided into 5 groups on the basis of the PWC_{170} test. Hemodynamics were measured in a lying position and then while standing. Results showed that there were marked differences in the way the groups reacted to the standing tests. Those with the lowest activity levels underwent blood pressure changes, reduced heart contraction strength and lessened blood supply to the myocardium, with increased peripheral blood pressure. Those with higher activity levels showed less reaction to the standing regime in these parameters.
References 6 (Russian).
[251-12131]

PUBLIC HEALTH

DEVELOPMENT OF PUBLIC HEALTH CARE IN USSR

Moscow VESTNIK STATISTIKI in Russian No 2, 1985 pp 61-66

[Text] "USSR citizens are entitled to health care.

> This right is implemented by free and qualified medical care, which is rendered by state public health institutions, expansion of the network of institutions for treatment and strengthening the health of citizens...." Constitution of the USSR, Article 42.

One of the most important distinctions of Soviet health care is its preventive orientation. Different categories of industrial workers are periodically submitted to preventive examinations (with consideration of their working conditions), and this also applies to employees at communal, children's, therapeutic-preventive and other institutions. Special importance is attributed to preventive screening of children, pregnant women, adolescents, students at secondary and higher educational establishments.

The number of patients under dispensary supervision is increasing from year to year; in 1983, their number exceeded 58 million people.

The number of medical personnel available to the public is growing constantly. Our country is in first place in the world in availability of physicians for the public.

Among the medical institutions that render therapeutic and preventive services to the public, those that render care on an outpatient basis--polyclinics, walk-in offices, dispensaries, polyclinic departments of hospitals, medical health centers, etc., the network of which is constantly expanding--take care of the largest number of people and are closest to the public.

As compared to 1970, there was a 1.4-fold increase in 1983 in number of visits to physicians, and it constituted more than 3 million, or an average of 11 visits per year per person.

The USSR is among the countries with the highest indicators for availability to the public of hospital beds.

Basic indicators of health care development (as of end of the year; thousands)

	1940	1960	1970	1980	1983
Number of physicians in all specialties	155,3	431,7	668,4	997,1	1104,3
Number of paramedical personnel	472,0	1388,3	2123,0	2814,3	3035,4
Number of hospital institutions[1]	13,8	26,7	26,2	23,1	23,1
Number of hospital beds	790,9	1739,2	2663,3	3324,2	3497,5
Number of medical institutions that render outpatient-polyclinic care[2]	36,8	39,3	37,4	36,1	37,7
Number of women's consultation offices, children's polyclinics and walk-in centers (independent and part of other institutions)	8,6	16,4	21,0	24,3	26,8
Number of beds (medical and obstetric) for pregnant women and parturients	147,1	213,4	223,8	230,4	240,2

[1]Decline over a period of several years in number of institutions rendering intramural and outpatient care is attributable to reorganization and enlargement of such institutions.

[2]The medical institutions that render outpatient services to the public include all medical institutions that have outpatient offices (polyclinic, walk-in centers, dispensaries, polyclinic departments of hospitals, medical health centers, etc.).

There has been significant increase in volume of hospital care: in 1983, more than 67 million people were admitted to hospitals, versus 52 million in 1970.

Extensive health-improving measures are implemented in our country. Such dangerous infectious diseases as the plague, smallpox, parasitic typhus, which caused major disasters in the past, have long since been eradicated. At the present time, only isolated cases are recorded of malaria, poliomyelitis, diphtheria, and the incidence of other infectious diseases continues to decline. There has been systematic decline of morbidity involving temporary disability: as compared to 1980, the number of cases of disease dropped by 12% and days of disability dropped by 9%.

Preventive examinations in different Union republics

	People submitted to periodic check-ups (thous)			People who should undergo periodic check-ups, %		
	1970	1980	1983	1970	1980	1983
USSR	**101281,1**	**112547,4**	**117203,1**	**94,3**	**95,6**	**96,0**
RSFSR	50529,4	54607,9	57133,0	93,9	95,6	96,3
Ukrainian SSR	21336,6	22065,7	21812,0	97,2	98,0	98,2
Belorussian SSR	3480,6	4046,5	3982,9	96,9	98,0	98,4
Uzbek SSR	6395,5	8583,5	9541,4	94,3	93,1	93,3
Kazakh SSR	6010,3	7195,7	7581,3	91,6	92,6	93,5
Georgian SSR	2429,9	2283,9	2424,2	96,8	97,6	97,3
Azerbaijan SSR	1967,8	2485,3	2677,4	92,0	97,8	98,0
Lithuanian SSR	1186,4	1430,7	1517,3	97,7	99,0	99,5
Moldavian SSR	1704,4	1881,5	1938,1	95,4	97,3	98,1
Latvian SSR	921,4	1067,7	1089,5	99,0	99,5	99,2
Kirghiz SSR	1261,8	1877,1	1972,7	89,2	93,5	94,7
Tajik SSR	1036,5	1599,9	1849,5	73,0	80,3	83,7
Armenian SSR	1432,4	1380,6	1432,3	95,5	94,8	95,8
Turkmen SSR	1093,4	1401,7	1582,0	83,3	86,7	87,3
Estonian SSR	494,7	639,7	669,5	96,2	97,6	97,0

Availability of physicians in different Union republics

	Physicians per 10,000 population				
	1940	1960	1970	1980	1983
USSR	**7,9**	**20,0**	**27,4**	**37,5**	**40,4**
RSFSR	8,2	20,8	29,0	40,3	43,3
Ukrainian SSR	8,4	19,9	27,7	36,5	39,7
Belorussian SSR	5,7	16,4	25,8	33,9	36,0
Uzbek SSR	4,7	13,9	20,1	28,5	31,8
Kazakh SSR	4,3	14,0	21,8	31,8	35,2
Georgian SSR	13,3	33,0	36,4	48,1	51,3
Azerbaijan SSR	10,0	23,7	25,0	33,4	36,1
Lithuanian SSR	6,7	17,4	27,5	38,9	41,8
Moldavian SSR	4,2	14,3	20,5	31,4	35,2
Latvian SSR	13,2	26,4	35,9	43,9	46,8
Kirghiz SSR	3,8	15,4	20,8	29,1	31,7
Tajik SSR	4,1	12,7	15,9	23,5	25,5
Armenian SSR	7,5	24,0	28,7	34,8	36,7
Turkmen SSR	7,6	18,7	21,3	28,3	30,3
Estonian SSR	10,0	23,9	33,1	41,6	44,8

Availability of paramedical personnel in different Union republics

	Number of paramedical personnel per 10,000 population				
	1940	1960	1970	1980	1983
USSR	24,0	64,2	87,2	105,7	111,0
RSFSR	26,1	67,7	92,8	114,0	119,2
Ukrainian SSR	24,1	63,9	86,9	103,1	107,7
Belorussian SSR	19,7	54,2	80,8	97,6	104,8
Uzbek SSR	18,2	44,1	64,7	83,5	89,7
Kazakh SSR	18,6	57,1	80,2	99,8	108,2
Georgian SSR	25,6	73,3	91,7	111,9	114,6
Azerbaijan SSR	22,5	65,6	76,0	84,3	89,4
Lithuanian SSR	6,9	53,1	78,1	108,3	117,2
Moldavian SSR	9,8	54,0	77,2	95,2	104,3
Latvian SSR	18,7	71,8	93,4	115,9	122,1
Kirghiz SSR	16,1	48,8	72,4	86,3	91,4
Tajik SSR	17,0	39,7	51,4	65,0	68,8
Armenian SSR	17,1	59,5	69,9	81,0	87,8
Turkmen SSR	35,5	65,5	72,2	78,4	83,3
Estonian SSR	14,1	77,5	93,8	105,0	111,9

Number of medical institutions rendering outpatient-polyclinic services to the public in different Union republics

	1940	1960	1970	1980	1983
USSR	36843	39311	37360	36122	37722
RSFSR	20 527	21 918	19 903	18 662	18 815
Ukrainian SSR	7 737	7 055	6 417	5 954	6 137
Belorussian SSR	1 561	1 370	1 493	1 319	1 342
Uzbek SSR	1 187	1 586	1 767	2 209	2 623
Kazakh SSR	1 059	2 018	2 220	2 366	2 683
Georgian SSR	1 545	1 364	1 392	1 333	1 353
Azerbaijan SSR	931	912	1 075	1 069	1 267
Lithuanian SSR	352	468	484	401	404
Moldavian SSR	337	405	428	559	590
Latvian SSR	141	524	405	346	348
Kirghiz SSR	319	315	343	352	388
Tajik SSR	245	298	371	465	577
Armenian SSR	268	414	457	475	494
Turkmen SSR	360	373	323	363	447
Estonian SSR	274	291	282	249	254

Availability to the public of hospital beds in different Union republics

	Hospital beds/10,000 population				
	1940	1960	1970	1980	1983
USSR	40,2	80,4	109,4	124,9	127,9
RSFSR	43,3	82,1	112,5	129,6	132,9
Ukrainian SSR	37,7	79,8	107,9	125,4	129,1
Belorussian SSR	32,6	67,9	104,1	125,2	127,7
Uzbek SSR	30,1	83,9	101,7	113,1	118,4
Kazakh SSR	39,5	80,4	118,4	130,1	132,6
Georgian SSR	36,0	72,3	91,5	107,1	107,2
Azerbaijan SSR	37,8	69,1	93,4	96,8	97,8
Lithuanian SSR	30,0	77,6	102,4	119,8	122,0
Moldavian SSR	24,6	72,3	99,0	120,0	123,0
Latvian SSR	63,0	107,2	118,9	136,8	138,2
Kirghiz SSR	24,1	73,5	106,7	119,7	119,7
Tajik SSR	28,6	67,1	97,7	98,8	103,0
Armenian SSR	30,1	69,1	85,6	83,4	83,1
Turkmen SSR	41,6	83,0	101,7	104,5	104,3
Estonian SSR	47,7	94,0	110,3	124,1	125,4

Number of women's consultation offices, children's polyclinics and walk-in centers (independent and part of other institutions) in different Union republics

	1940	1960	1970	1980	1983
USSR	8603	16397	20955	24293	26821
RSFSR	4 917	9 460	11 504	12 586	13 351
Ukrainian SSR	1 821	3 484	4 649	4 951	5 356
Belorussian SSR	311	459	550	623	666
Uzbek SSR	276	452	807	1 443	1 878
Kazakh SSR	269	624	982	1 450	1 579
Georgian SSR	283	332	472	551	631
Azerbaijan SSR	166	231	313	651	1 063
Lithuanian SSR	51	194	203	235	248
Moldavian SSR	40	188	222	225	254
Latvian SSR	109	201	215	238	255
Kirghiz SSR	66	198	292	329	379
Tajik SSR	71	130	201	356	446
Armenian SSR	60	185	245	236	242
Turkmen SSR	106	136	174	262	309
Estonian SSR	57	123	126	157	164

There is a state system in the USSR for mother and infant care. The network of women's consultation offices, children's polyclinics and walk-in centers is expanding consistently.

In the overall system of measures to improve the health of the public, a large role is played by sanatorium-resort therapy, vacations and tourism, organization of which is being constantly upgraded in our country.

Sanatoriums and vacation institutions

	1939	1960	1970	1980	1983
Number of sanatoriums, boarding houses with treatment and sanatorium-preventoriums	2 166	3 172	4 157	4 909	5 229
bed capacity: thousands	255,5	368,2	579,1	762,0	821,7
per 10,000 population	13,2	17,0	23,7	28,6	30,0
Number of homes, boarding houses and vacation bases	1 270	887	4 418	7 269	8 174
places in them: thousands	194,7	178,5	574,9	1014,5	1096,8
per 10,000 population	10,0	8,3	23,6	38,1	40,1
	164	222	592	963	958
Number of tourist hotels and bases	18,9	36,4	157,4	361,1	373,0
places in them: thousands	1,0	1,7	6,5	13,5	13,6
per 10,000 population					

Number of individuals and vacationers (thousands) in sanatoriums and vacation institutions

	1960	1970	1980	1983
Total people treated and vacationing in sanatoriums and vacation institutions (not counting 1-2 day vacations)	6 744	16 836	40 040	45 383
breakdown: at sanatoriums, boarding houses with treatment and resort polyclinics with authorizations for course of therapy	2 655	4 400	6 222	6 641
at sanatorium-preventoriums	424	1 196	2 876	3 353
at homes, boarding houses and vacation bases	3 103	6 199	8 439	8 856
at tourist hotels and bases	562	5 041	22 503	26 533

Physical culture and sports

	1960	1970	1980	1983
Number of physical culture groups, thousands	186	210	232	255
Number of people regularly engaged in physical culture and sports, millions	49,0	61,6	77,6	87,4
including women	17,9	24,4	33,5	34,9
Stadiums (with seats for 1500 or more spectators)	1·981	2 918	3 693	3 622
Sports arenas, thousands	15	45	74	75
Swimming pools	896	905	1 750	2 530

Expenses (billions of rubles) for measures pertaining to industrial safety

	1971–1975		1976–1980		1981	1982	1983	1984
	Total	mean per year	Total	mean per year				
All expenses	15,4	3,1	19,8	4,0	4,2	4,6	4,9	5,2
including no expenses for personal protective equipment, therapeutic and preventive diet and milk	8,2	1,6	11,2	2,2	2,3	2,4	2,6	2,7

There are sanatoriums and vacation institutions, the number of which is growing from year to year, for workers and members of their families. There has been broad development of vacation bases of enterprises, institutions and organizations, the facilities in which constitute almost half the bed resources of all types of vacation institutions. A form of active recreation, such as tourism, enjoys particular popularity with the public. There has been significant expansion of the network of sanatorium and resort institutions, and vacation institutions, not only at the well-known southern resorts of Crimea and the Caucasus, but in regions of Siberia, the Urals, Far East, Kazakhstan and Central Asia, central regions of Russia and the Baltics. At the resorts, much attention is being given to improving the quality of treatment, introducing more sophisticated therapeutic and diagnostic methods with due consideration of the current achievements of medical science.

At the present time, there are 170,000 beds in children's sanatoriums, which is about one-third the total number of beds in sanatorium-resort institutions. At children's health institutions, special attention is given to proper organization of regimen, which provides for optimum combination of treatment, educational-rearing work and recreation. In addition to children's sanatoriums, there are sanatoriums and boarding houses for parents with children, in which both adults and children receive integrated resort therapy. In 1983, of the total number of places in vacation institutions, 931,000 were reserved for family vacations.

About 60 million people undergo treatment each year in sanatoriums, rest in vacation institutions, along tourist routes and bases, including 1-2-day rest periods. More than one-quarter of those who were treated for long periods of time (80% in trade-union institutions) in 1983 were given travel passes at the expense of social security and state budget funds, either free of charge or at reduced prices paying only 30 and 50% of the cost. In addition, thousands of workers received travel passes free of charge or at a reduced rate at the expense of the the social-cultural measures fund and enterprise fund.

More than 28 million children and adolescents spent their vacation in the summer of 1983 at Pioneer and school camps, excursion-tourist bases or traveled to resort localities with children's institutions for the summer.

Steps are being taken in our country to further develop excursions and tourism: services are increasing in volume and improving in quality; the network of tourist-excursion institutions is expanding.

Physical culture and sports are instrumental in harmonious development, creative activity and improving health of Soviet people.

In the USSR, all the necessary conditions are provided for physical culture and sports to be practiced on a really mass scale--the volume of financing is growing, the material and technical base is developing, and there is expanded training of personnel specializing in physical culture and sports.

About 30 million award-winning physical culture personnel given the "Prepared for Labor and Defense" badge, which is the scheduled and standard basis of the Soviet system of physical education, are trained each year. The skill of Soviet athletes is also growing: in 1983, the high title of world champion was bestowed upon 144 people, and that of European champion was bestowed upon 175 people, 44 and 43 of whom, respectively, were women. A wide network of children's and youth sports schools was developed for children and adolescents who want to engage in athletics, and they numbered 7426 in 1983, with an attendance of 3,560,000 people.

As compared to 1975, industrial traumatism for the entire national economy decreased by 33% in 1984.

The Soviet Union is among the countries that have a low level of industrial traumatism.

10,657
CSO: 1840/250

BRIEF

MEDICAL CARE OF AGED--The editorial offices received many letters related to publication in our newspaper of an answer to the question of L. Orlova from Moscow on 8 December 1984; the writers ask for an explanation concerning which pensioners retain the right to use the agency polyclinic. In particular, we are asked about this by N. Rozhkova from Smolensk. The basic guideline for medical care in our country is the territorial principle, and it provides for medical care to all of the public, including pensioners. At the same time, there are sometimes agency therapeutic-preventive institutions at enterprises and organizations, which are intended primarily for workers. There is limited opportunity to care for pensioners in such institutions and it is not the same in all instances. For this reason, with regard to medical services to pensioners by agency polyclinics, an error was made in the answer of our newspaper on 8 December 1984. The right to use polyclinics, to which workers were assigned before they retired, is granted to participants of the Great Patriotic War. By decree of the Presidium of the AUCCTU dated 28 September 1983, it was additionally established that the opportunity to receive medical care at agency polyclinics is granted to labor veterans on the basis of collective contracts, as well as agreements made between the central committees of trade unions and relevant ministries and agencies. [Text] [Moscow TRUD in Russian 26 Feb 85 p 2] 10,657

CSO: 1840/250

FIRST STEPS TOWARD GENERAL HEALTH MAINTENANCE

Moscow TRUD in Russian 7 Feb 85 p 2

IL'ICHEVA, Ye. and LUKASIK, Yu., Trud reporters

[Abstract] The article presents a round-table discussion covering the problems and experiences encountered by several communities in implementing the CPSU 1983 Plenum mandate for a general health maintenance preventive program ["dispensarization"]. V. Ovcharov, director of the Scientific Research Institute for Social Hygiene and Health Care Organization imeni N. Semashko, commented on early Soviet preventive medicine efforts. Other health institute officials commented on the special attention directed at health care services in the cities of Gorokhovets and Fomin. Public reactions ranged from great enthusiasm to doubt as to the need of visits by well patients, but acceptance was gradually achieved. Local clinics reorganized their operations to accommodate the new approach to health care. New training for physicians and assistants, and electronic aids to speed services, are outlined. Wide use of fluoroscopic and X-ray diagnosis require improved availability and processing of film for these processes. Other problems, it was felt, could be resolved by improved logistics and publicity programs.
[257-12131]

RECRUITING HOSPITAL ATTENDANTS

Moscow SOVETSKAYA ROSSIYA in Russian 31 Jan 85 p 2

BELYAYEV, V., special correspondent

[Abstract] A dedicated hospital orderly or attendant is becoming a rarity, a situation that must be corrected to encourage new entrants into that occupation. The difficulties of recruiting people into that occupation are many, not the least of which are low pay and often unpleasant working conditions. Yet the orderly is often the person the patients depend on for immediate assistance and in many other ways that make a stay in hospital more bearable. Measures have been taken to improve the pay scale and increase the respect that orderlies deserve. These improvements are based

on the quality of work and recognition that their function frequently releases nurses and physicians from mundane tasks to concentrate on matters more in line with their primary responsibiliti s.
[233-12172]

GLASSES BY PRESCRIPTION ONLY

Yerevan KOMMUNIST in Russian 3 Feb 85 p 3

[Abstract] A letter by a teacher, S. Ananyan, to KOMMUNIST on the problems experienced by some people with glasses, including the fact that some individuals secure glasses without a physician's prescription, has led to a response from E. S. Torosyan, chief of the Main Republic Administration of Armmedtekhnika [Armenian Medical Technology]. He explained that the problem lies in nonadherence to laws and regulations governing the grinding and dispensing of glasses, and that steps are being taken to enforce them. In addition, optical offices are being staffed by ophthalmologists, and their active cooperation with opticians is encouraged. Under no circumstances should people secure nonprescription glasses, as that can lead to further deterioration of vision and even total blindness.
[237-12172]

SCIENTIFIC AND TECHNICAL ADVANCES AND FURTHER IMPROVEMENTS IN WORK SAFETY IN CONSTRUCTION INDUSTRY

Moscow PROMYSHLENNOYE STROITEL'STVO in Russian No 1, Jan 85 pp 4-5

DVORNIKOV, S. L., deputy chairman, Office of State Construction

[Abstract] Prevention of industrial accidents and occupational diseases at construction enterprises remains one of the key areas of concern to the party and the government, along with modernization of the construction technology, the increasing use of prefabricated components, and a more scientific organization of labor. The successful combination of these various aspects of the construction industry has resulted in a 19% increase in work productivity during the current Five Year Plan. It is noted that workers engaged in the construction industry are motivated by the same high ideals as the entire Soviet people, and will contribute the utmost of their abilities and energy to make the coming 12th Five Year Plan a resounding success.
[218-12172]

JUSTIFICATION OF REQUEST FOR EMERGENCY MEDICAL ASSISTANCE

Khabarovsk TIKHOOKEANSKAYA ZVEZDA in Russian 30 Jan 85 p 2

TROPNIKOVA, V., deputy chief physician, Khabarovsk Medical Emergency Service

[Abstract] The efficiency of the medical emergency services [skoraya pomoshch] in Khabarovsk could be considerably increased and the lives of medical personnel made considerably easier if more consideration and deliberation were to be shown by the calling parties. In many cases, erroneous information is given to the dispatcher resulting in the dispatching of the wrong team, i.e., a team of generalists rather than a pediatrics or a cardiologic team, while other callers simply feel that no specific information is required and that it is an imposition when they are asked for details regarding a given medical emergency. Other problems are posed by people calling the emergency number [03] for entertainment or for making obscene phone calls, and children on vacations with "nothing to do" represent yet another problem. To alleviate some of these problems and explain the nature and purpose of the emergency service, an open house will be held on July 24, 1984 [sic].
[235-12172]

PUBLIC HEALTH AS NATIONAL WEALTH

Moscow TRUD in Russian 19 Feb 85 p 3

BELITSKIY, V.

[Abstract] A talk with O. P. Shchepin, professor and first deputy minister, USSR Ministry of Health, provided greater insight into the health program initiated in January 1985, which is to provide delivery of health care and assure a healthy public in the USSR through the period 1985-1990. The cornerstone of Soviet health policy consists of the institution of the periodic health examinations [dispensarization] which are to encompass the entire Soviet people. In addition, to straightforward medical care, efforts are underway to further improve the working conditions in industrial and agricultural sectors, and to enhance hygienic monitoring in every walk of life. It has been estimated that the improvement in the health status of 25-30 million Soviet workers will increase the overall labor productivity by 2-3%. In order to secure full success of this program and derive all the benefits that are possible, it will require close cooperation between the USSR Ministry of Health and the other ministries and departments, including the educational and journalistic organizations. One of the most important contributions that the journalistic profession will be able to make is to encourage the people to participate in this effort to the fullest extent, and to provide accurate and timely health information.
[1740-12172]

CONTRIBUTION OF COMMON SENSE TO HEALTH AND LONGEVITY

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 24 Feb 84 p 4

DMITRUK, M.

[Abstract] Recently the editors of SOTSIALISTICHESKAYA INDUSTRIA were visited by V. Mikhailov, candidate of technical sciences, who presented some of his common sense views on health. While few would advocate that we revert to a more healthy diet of the type enjoyed by our ancestors millions of years ago, there is a general feeling that the diet of the modern man is too artificial, too processed and refined, and contains too many chemicals. Mikhailov stressed the importance of rest, exercise, and recreation as both a mental and physical stimulant, and showed a preference for aerobic exercises as a step in the right direction. He explained how some foreign physicians regard washing hands before eating as a futile exercise since we inhale millions of various types of microorganisms, many of which can cause disease, without ill effects. In fact, such exposure to the environment is what builds up our immunity, and mothers should not be too concerned about their babies getting into a little dirt. In short, a return to a more natural, outdoor type of life and habits, exercise and natural foods are a way to a longer and healthier life, especially when complemented by such tonic measures as saunas.
[236-12172]

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